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SIXTH
ANNUAL REPORT
OF THE
PRESIDENT AND DIRECTORS
TO THE
STOCKHOLDERS
OF THE
BALTIMORE AND OHIO
RAIL ROAD COMPANY.

BALTIMORE:
PRINTED BY WILLIAM WOODDY,
No. 6, S. Calvert street.
1832.

SIXTH ANNUAL REPORT.

THE period having arrived, when the charter of this Company again requires that an exposition of its affairs, should be presented to the Stockholders, the President and Directors now proceed to make their Sixth Annual Report, of the condition and prospects of the work entrusted to them.

The present points of termination of the Baltimore and Ohio Rail Road, are, the City Block, in Baltimore, and the Point of Rocks on the Potomac river, a distance of sixty-nine miles; to which must be added the lateral road to the city of Frederick, three and a half miles more, making the whole extent of the Rail Road seventy-two and a half miles.

At the time of presenting the last Annual Report, there had been completed, of the above distance, a single track on twenty-five miles to the forks of Patapsco; the necessity of using the first laid track of Railway, on the second division, however, to facilitate the construction of the second track, confined the regular transportation of the company to the first division, between Baltimore and Ellicotts' Mills—other parts of the Railway had also been laid down, but were not then in a condition to be used.

The Board had always held out the idea, to the Stockholders, that the communication, by the Railway, would be opened with the city of Frederick, during the year 1831: and although the practicability of this was doubted by many, yet the great exertions that were made by the officers, agents and contractors, in the service of the company, effected the object, within the time specified, and on the first day of December last, the Board passed, with a train of cars, over the whole extent of the Road to Frederick, and formally opened it, for the transportation of merchandise, and the conveyance of passengers, between the two chief cities of the state

The Board cannot forbear on this occasion, to notice the kind and hospitable reception given to them by the people of Frederick, and the sincere gratification which seemed to pervade the entire population of that enterprising city, at the successful result of the Company's labours in the completion, thus far, of the great avenue to the West.

The main stem of the Railway from the Monocacy to the Point of Rocks, was not completed, so as to permit the regular use of it, until the first of April last, when a train of cars passed over it, bearing to Baltimore, produce which had descended the Potomac. Since that time several warehouses have been erected by individuals at the Point of Rocks; taverns, dwellings and other improvements are rapidly rising there, and the facilities of transferring produce from the river to the road, being for the present sufficient, the boatmen and farmers of the country to the West upon the Potomac, are resorting more and more, daily to the Point of Rocks, as the most convenient spot, from which to reach the Baltimore market. When to this, is added, the travel for pleasure from Frederick,—the proceeds of that part of the main stem between Monocacy and the Point of Rocks, are found to constitute no unimportant item in the general receipts of the Company.

After the completion, throughout, of the first track of the Railway, to the city of Frederick, the whole disposeable force of the Company was employed upon the second track; and the Board have now the satisfaction of announcing to the Stockholders, that the entire line of Road, from the Depot on Pratt-street, to the Monocacy, is finished with two sets of rails. The work has been done in a manner, highly satisfactory to the Board, and creditable to those immediately entrusted with its execution. The same character distinguishes it throughout Every thing is equally well done, and the same care has been bestowed upon those parts, which pass through a wild and thin ly settled county, that is evident in the more immediate neighborhood of this city. Experience has, of course, enabled this to be effected, at much less cost, than was incurred in the first instance; but, in no case, has there been a sacrifice of that durability, and excellence of construction, upon which the continuing utility of the work is to depend. Since the Railway has been put down upon the road, every attention has been bestowed upon maintaining the whole, in constant good condition, so as to prevent the necessity, at any one time, of large expenditures for delayed repairs, or any intermission in the use of the road, while repairs may be going on. In this way the Board feel confident, that the annual wear and tear of the road may be reduced to an exceedingly small amount; and by being equally divided among successive years, be scarcely felt in estimating the nett revenue of the work.

The lateral Railway to Frederick consists now of a single track, only with a turnout and sideling, at about half way between the main branch and the Depot. This is found, as yet, to be sufficient to accommodate the ordinary transportation. The graduation, however, has been prepared for two tracks, whenever they shall be required.

Upon the main stem, from the Monocacy to the Point of Rocks, there is also but one track of Rails with sidelings and turnouts. The graduation, however, is completed for two tracks, and materials necessary to construct the second, have been prepared, and a portion of them are at convenient depots along the line; so that at any time, when the trade and travel require it, this track can be completed within a month from the date of commencing it. In the mean while the string pieces and sleepers are seasoning and daily becoming more fit for use.

There is now completed a distance of seventy-two and a half miles of graduated Rail road, upon which have been laid, including sidelings, rails equal to one hundred and thirty and a half miles of single track—upon the whole of which an active trade is daily carried on. In this distance, every mode of construction has been tried. The granite and iron rail—the wood and iron on stone blocks—the wood and iron on wooden sleepers, supported by broken stone—the same supported by longitudinal ground sills, in place of broken stone—the log rail formed of trunks of trees, worked to a surface on one side to receive the iron and supported by wooden sleepers—and the wrought iron rail of the English mode—have all been laid down, and at this time form different portions of the work. In the trade which has passed over this Railway, every kind of vehicle adapted to Rail road transportation, has been used, and every species of motive power employed.—Heavily loaded cars of granite have been constantly drawn from near to, and beyond Ellicotts' Mills to Baltimore—merchandize has been conveyed at from four to six miles the hour, and passengers at from ten to twelve and thirteen, by horses; and *steam* has been tried at every velocity, from ten to twenty miles; and regularly used for a distance of forty miles, to the foot of the inclined planes, at an average speed of from twelve to fifteen, in the conveyance of passengers—so that not only have the modes of construction been tested, but the most satisfactory *data* for ascertaining the wear and tear of the road are in possession of the Company.

It is a cause too of no little gratification to the Board, to be able to state, that the expenditures, during the past year, for the construction of the Railway have fallen considerably within the estimates: although these, when made, had been considered as low, with regard to the work to be executed—the character of the country, the difficulty of transportation, the want of labour, and other circumstances, that did not exist, or were not felt, when the limit of the road was still within a short distance from Baltimore. It will be seen from the reports of the superintendents of graduation and construction, that the actual cost is $19,912.96 less than the estimates. [see Appendix I. & J.]

Under all these circumstances, speculation is no longer necessary. Facts now stand in the place of opinions—results in place of calculations. *And upon a full and careful examination, the Board feel no hesitation in assuring the Stockholders that the completion of the work to its termination on the Ohio, upon the plan first contemplated with a double track of Rails, is perfectly practicable within the original estimate of twenty thousand dollars per mile, excluding, in the average, the greater out-*

lay upon the first division of the road, and this too without the sacrifice to economy of any one requisite of durability and excellence.

It rarely happens in the execution of great public works, which are to depend for success, upon circumstances, whose future existence is but a matter of present calculation, that the result fulfils, in every respect, the anticipation of the projectors and undertakers; and most frequently it falls to the lot of those entrusted with the management of them, to apologise for disappointments, by tracing their causes to unforeseen occurrences, beyond the power of prudence to prevent. During the progress of the Baltimore and Ohio Rail Road, it has often been said, that it would share this fate with most other great works, undertaken by individual enterprize; and there certainly have been periods in the existence of the company, when surrounded by numerous and complicated difficulties, the fulfilment of such predictions might apparently seem not to be improbable. In fact, until the first grand division of the Road between Baltimore and the Potomac, was completed, no fair test had been offered, fully to ascertain its merits, or by which to compare it with the original anticipations of its importance and value. This distance is now completed; and tried by the test thus furnished, the Baltimore and Ohio Rail Road presents one of the very few undertakings of public works by private means, in which no reasonable hope has been disappointed; but in which every expectation has been realized. The adaptation of the Rail road system to general traffic,—that point so long disputed, has been fully and forever set at rest. Every species of agricultural productions, lime, timber, lumber, fire wood, even paving stone, have been brought to Baltimore, with profit to those using the road as a means of transportation for articles so bulky and so cheap: and in return, and at an enhanced toll, but with equally profitable results, plaister of paris, coal, boards, bricks, and scrap iron have been sent into the interior.

When articles so varied, and some of them of so small value, can be carried profitably to their owners, and to the company, no doubt can exist as to the profits arising to both, on merchandize and passengers. Neither has the sparse population of the country through which the road for long distances passes;—nor its rugged character,—had its anticipated effect, of rendering it comparatively valueless. On the contrary, the existence of the road has brought into use articles, in this very country, which were before valueless to their possessors—and forests and quarries now furnish resources to the land owner, which, but for the Rail road, would have fallen and rotted where they stood, or remained forever, unknown or undisturbed in the bowels of the earth. In this way the profits of the road have been increased from sources that were unthought of, when it was projected, and all this in the short period which has elapsed, since the commencement of the present year. It was to have been expected from the experience of other places, that the facilities furnished for the transportation of passengers, would increase the travel, between the two cities, connected by the Rail road, and the result has fully justified the anticipation—so that, in fine, looking back to the views and plans of those, who undertook the road, it is difficult to find one, that has not been substantially gratified and carried into effect.

In assuming this confident tone in their official communication to their constituents, the Stockholders of the Baltimore and Ohio Rail Road Company, the Board do not do it lightly, but act under a full sense of their responsibility for the representations which they make. But as before remarked, they have already in their possession ample *data* in undeniable facts. The road which has been constructed by them, is the longest, in the world. Circumstances made it, from the commencement, necessarily a series of experiments. Every mode of construction has been tried—every species of moving power has been employed; and every character of produce, merchandise and passengers have been transported upon it. The Board, therefore think, that it must be admitted on all sides, that there has been ample opportunity within their reach of becoming acquainted with the value and importance of the road; and it i the knowledge which they have thus obtained that justifies th confidence of their present statements.

Among the events of the last year, connected with the progress of the work, to which the Board adverts with the greates pleasure, is the result of the experiments in the use of the locomotive engine. It will, no doubt, be recollected that the unavoidable curves and ascents of the road, induced many to believe that the use of steam, to any extent, was impracticable; and that horse power must be applied at all events, upon much the greater portion of the road. A small engine, however, constructed by Peter Cooper, Esq. of New York, made several trips up the ascents and through the curves, between Baltimore and Ellicotts' Mills; and an engine for the conveyance of passengers, built by Davis and Gartner, of York, Pennsylvania, has recently been employed, with but little intermission, for upwards of a month, doing the entire transportation of passengers between Baltimore and the foot of the inclined planes, a distance of forty miles; travelling, therefore, with a train of cars, a distance of eighty miles every day. Its construction is novel, compact, and very simple, not liable to derangement; and as experience has in some degree shown, requiring few repairs, working without jar, and, apparently, with nearly as little wear and tear as if stationary; presenting its whole machinery to the hand of the Engineer, without requiring him to move from his proper station on the car, either to see it, or govern its operations, and fully proving the adaptation of this road to the use of steam power. Satisfactory as it is, however, and independent as it makes the company of foreign aid, it is considered but as the commencement of a series of experiments, which will, even more fully than has yet been done, prove the adaptation of steam and Rail roads to every part of our country, and for all the purposes of trade and travel.

Various other ingenious experiments have been made by enterprizing individuals in the construction of locomotive engines for this road. Among whom it would be unjust not to mention particularly Peter Cooper, Esq. who has not relaxed his efforts to bring his engine to perfection. George W. Johnson, and Minus Ward, of Baltimore, T. Welsh, of Gettysburg, Pennsylvania, and Thomas James, of the city of New York, have also all been engaged in this now important branch of the mechanic arts, and they confidently expect, when they shall have completed their experiments, to produce results highly satisfactory. The diversity of talent, indeed, that is now employed on this subject, gives the best promise of the most brilliant success.

Besides the increased rapidity of motion which will be the consequence of the introduction of steam upon the Railway, the Board are already able to announce, that it will make a most important reduction in the cost of transportation to the company. By comparing the expense *per diem* of the locomotive engine, including the wages of hands, the cost of fuel, the wear and tear, and the interest on the value of the engine, supposing it to become useless in a given time, with the expenses attending the transportation by horse power, to produce equal effects; the saving to the company, in the conveyance of passengers, has been found to be about fifty per cent in favor of steam. [See Appendix, document M.] This decrease in the cost of transportation, while the traffic and travel on the road continue rapidly to increase, justifies the confidence of the Board in their anticipations of the profits and consequent value of the stock of the company.

The Board, while on this subject, take occasion to remark, with much satisfaction, that by the introduction and use of steam on the road, the opinion heretofore entertained and expressed of the general excellence of its location and graduation is confirmed.

In the former reports of this Board, it has frequently been their duty to refer to the existence of a controversy with the Chesapeake and Ohio Canal Company, for the choice of routes along the northern shore of the Potomac river. The adoption of that route for the prolongation of the Rail road to the western country, was followed by the acquisition of titles to the lands over which it would pass, from the proprietors on the river. The advice of eminent legal counsel, had led the Board to believe that such titles were valid, nor was their opinion altered by the fact, that a charter was in existence on the statute book, authorizing the future incorporation of a Canal Company, and making it the heir, or assignee, of the old Potomac Company. When this Board obtained the titles in question, it was under the advice that the Potomac Company possessed no rights, which could conflict with them, and that the Chesapeake and Ohio Canal Company not being in existence, and its future existence doubtful, it could possess no titles, to which those acquired, in due form of law, by the Rail Road Company, would not be paramount. Under these impressions this Board acted, when it was enjoined by the Potomac Company, and stockholders of the Canal Company, and a protracted legal controversy was the consequence. With the progress of this controversy, the stockholders have been made acquainted by former reports, and it is not intended now to repeat any of its details. The decision of the Chancellor of Maryland was twice, after full argument, pronounced in favor of this company, and the most sanguine hopes were entertained that the same result would follow the argument in the court of appeals. In this, however, as is known, public opinion in Baltimore, no less than the expectations of the Board, was disappointed. The trial was brought on very unexpectedly in December last, by the court, out of the ordinary course of proceeding, and in the absence of the senior counsel of this Board; whose place, however, it is proper to remark, was supplied, as it happened, by one whose brilliant effort on the occasion, left this Board nothing to desire. And, in the early part of January last, a decision was pronounced by three judges against two, one being absent from indisposition, reversing the decree of the Chancellor. This decision is now mentioned only as the formal annunciation of a fact. It is the supreme law of the state, from which there is no appeal; and as such it is most respectfully considered. It will be observed, however, from the differences of opinion in relation to the main question which existed in the legal tribunals themselves, that this question was certainly one of doubt; and that in acting upon the belief, that it must be decided in their favor, this Board cannot be charged with setting up a vain title for the mere purpose of causing difficulty and delay to a rival enterprize; nor should the result impair, nor has it impaired, the perfect confidence which the Board entertain, in the learning, skill, and ability of the legal advisers by whose direction they originally acted.

The decision of the court of appeals left four alternatives open to this Board.

1. To procure, if practicable, the permission of the Canal Company, for the joint construction of the two works from the Point of Rocks to Harper's Ferry, from which place various routes are open to the Rail road.

2. To construct the Rail road along side of the canal, upon such site as might remain unoccupied, after the right of choice had been exercised by the Canal Company.

3. To cross the Potomac river at the Point of Rocks, and ascend its southern, or Virginia, shore.

4. To tunnel through the mountain spurs.

The stockholders will bear in mind that this Board have never, for a moment, abandoned the idea of the ultimate completion of the Railway, to the point originally fixed for its termination, the Ohio river. And although a momentary discouragement may have followed the decision of the court of appeals, this was rapidly dispelled, as every day gave additional evidence, from the operations of the Railway then open between Baltimore and Frederick, of its superior advantages as a mode of communication between the eastern and western waters. Had it failed in any one particular to realize the anticipations of its projectors, it might have been possible that the check to feeling produced by the decision in question, would have paralyzed the efforts then making, and induced the abandonment of those in contemplation. As it was, however, the importance of the work being more deeply felt than ever, the obstacles that were now interposed only roused, to greater industry, the zeal of those intrusted with its management, and the Board hastened to assure the public of their still undiminished confidence of success.

The first of the above alternatives, as the most economical and convenient, was preferable, and the Board made forthwith the necessary applicaton to the Canal Company, to permit the joint construction of the Canal and Rail road from the Point of Rocks to Harper's Ferry. [See Appendix, Document A.] The practicability of this, the stockholders will recollect, had been satisfactorily established by surveys, instituted for the purpose, during the progress of the controversy in the courts; which surveys had been executed by the chief Engineers of the companies acting as commissioners from chancery. The in creased cost of such joint construction was not seven thousand dollars to each company, according to the report of the surveys: and the *entire* increased cost to *both* whatever that might be, the canal to be constructed of its full dimensions, the Rail Road Company in the propositions now submitted to its late opponent at law, proposed to bear. This proposition was rejected by the Board of Directors of the Canal Company, upon the ground, as it was understood, that injury and inconvenience to the canal was anticipated from its adoption. [See Appendix, Document B.]

It here becomes necessary to remark, that during the pendency of legal proceedings, an offer to compromise the contest between the two companies, *from the Point of Rocks to Harper's Ferry*, had proceeded from the Canal Company—which offer had been based upon the surveys of the commissioners, and involved the contraction of the width of the canal, and the payment of a portion of the increased cost of construction by the Canal Company. The Rail Road Company agreed to the offer, upon condition that the compromise, instead of being confined to the distance from the Point of Rocks to Harpers Ferry, *should be extended throughout the entire route to Cumberland*, so as to embrace all those points or passes, of the river, at which the two works might come into collision. This condition the Canal Company peremptorily refused to accede to; and the controversy was afterwards left wholly to the legal tribunals. Events have since proved that the true interest of the Rail Road Company, lay in accepting the offer to compromise, even although the arrangement would have extended only to Harper's Ferry—supposing, which is doubtful, however, that it could have been carried into effect, and those points of minor difficulty in the negotiation removed, which the Canal Company raised in the communication, which followed the reply of the Rail Road Company to the original offer. At the time, however, this Board believed with the information, then in their possession, and under feelings more natural, perhaps, than prudent, that unless the compromise extended to Cumberland it was useless to enter into it at all.

Now the fact above stated that the proposition for joint construction from the Point of Rocks to Harper's Ferry had originated with the Canal Company, in the first instance, however it may involve this company in the rejection of it, would, at first sight, appear to furnish ample proof that, at the time when it was made, the Canal Company did not apprehend any such injury or inconvenience to the canal, from the joint construction, as would materially interfere with its excellence or durability—for, had such injury or inconvenience been anticipated or believed possible, the offer to construct the two works jointly would have involved consequences to the canal that might ultimately have resulted in its destruction, and this the Board of the Canal Company would not have been justified in sanctioning for any considerations. That board, no doubt, thought that the advantage of a speedy completion of the canal to Harper's Ferry justified some sacrifice; and they were willing, therefore, to incur the increased cost of seven thousand dollars, and reduce their canal in width at certain places to obtain it; but it cannot be supposed that they believed that the canal, when built, would be less permanent with the Rail road along side of it, even though it might be protruded a few feet further into the river than it would have been were the Rail Road not in existence. Independent of this however, as answering the recent objections of the Canal Company, on the score of the injury and inconvenience to the canal that would follow the joint construction, the evidence of their own principal engineers, given on oath, shews his confidence in the practicability of constructing the canal, permanently, upon the shore of the Potomac at Galloway's mill, where the depth of the water is eight feet, and where the wall of the canal would contract the channel of the river one-sixth of its natural width. Little danger, therefore, was to be apprehended from the construction at the Point of Rocks, of the canal and Rail Road side by side, when the outer wall of the canal would be but in four feet water, and the width of the channel of the Potomac wide as it is at this place, would not be perceptibly diminished. If art could build the canal at Galloway's mill to resist the freshets of the stream—the same thing could certainly be much more readily and less expensively accomplished at the Point of Rocks.

Notwithstanding the above considerations, however, the Board of the Canal Company, having seen proper to reject the proposition of this Board, it became necessary to consider of the remaining alternatives to secure the prosecution of the Railway to the western waters.

In this situation of affairs, however, the Legislature of Maryland thought proper to interfere [See Appendix, document C.] It was a contributor to the funds of both works. It was interested in the progress of both, not only as a stockholder, but as the sovereign power that had called both into existence, and granted to both, privileges which could only be justified by the public good, which both were expected to confer. The state therefore interfered, and as a stockholder to the amount of one-seventh of the entire capital of the Canal Company, requested a meeting of the stockholders generally, with the view to such an arrangement between the two companies as would enable both works to pass through the territory of the state, and render unnecessary the adopting an alternative that would drive one of them from its confines. The state of Maryland was satisfied from the proof before it, that the joint construction herein so often spoken of, was compatible with the proper execution of both undertakings; and being above the reach of those feelings which may be supposed to result, naturally from a long controversy between individuals or corporations, and as one, whose equal interest made it impartial, it exerted itself in aid of the proposition already made by the Directors of the Rail Road Company to the Board of the Canal Company.

The meeting of the stockholders of the Canal Company was accordingly held, and the propositions of this Board, in detail, were submitted to it, and ably advocated by the talented and zealous representative of the stock held by the state in the Canal Company. [See Appendix, document D.] The meeting, however, adjourned from time to time, without coming to any conclusion for some months, during which interval, this Board, learning from different sources that objections had been made to its propositions, assented to their modification by the agent of the state in such a manner as to meet all the difficulties that had been suggested, at any time during the negotiations between the two companies, agreeing to construct the canal, at the points of collision, according to its most ample dimensions, for the sum at which it was then under-contract—to complete it by a fixed period, and to guarantee that it should stand for five years after, the Rail Road Company keeping it in repair during that time. [See Appendix, document E.]

After considerable delay on the part of the Canal Company, a committee of the stockholders presented a report on the fourth of August last, in which, views adverse to the above propositions are expressed, although no immediate action on them is recommended; while the committee however recommended the adoption of certain resolutions, proposing to the Rail Road Company, the appropriation of the yet unexpended balance of their capital to the completion of the *canal* to Cumberland, and the abandonment, for the present, at least, of all idea of a Rail Road beyond the Point of Rocks. [See Appendix, document F.] This report was accepted and adopted by the general meeting of the stockholders of the Canal Company, by a large majority of votes, and it is the only action, that has, as yet, taken place on the proposition urged by the state for a joint construction. The adoption of the report by the general meeting did not amount, certainly, to a rejection of the proposition, because, although the committee express themselves adverse to it, yet they say, "that no immediate action on their views, by the Canal Company, is required," while they distinctly *recommend* a separate proposition. The adoption of the report, therefore, was in fact a waiver of the main proposition of joint construction, and the substitution in its place, of another, with reference to which the committee "indulge the hope that the unfortunate and unprofitable controversy, which has so long subsisted between the two companies, may be adjusted."

As this singular proposition, appeared to be made, really in earnest, and came from a numerous and respectable body, thi

Board felt themselves bound to treat it seriously; but as may be well imagined, declined acceding to it—calling again the attention of the Canal Company, back to the original proposition that had been submitted to them—which the general meeting of the stockholders had been summoned to consider, and which, although not overlooked by the committee, had received no definitive answer from the Canal Company. [See Appendix Document G.] To this communication no reply has yet been received from the Canal Company.

In this state of things it is difficult to say what may become necessary on the part of the Board, in the further prosecution of the road westward. If the Canal Company had peremptorily refused to accede to the wishes of the state, it would at once have become the duty of this Board to have adopted measures accordingly; but, as it has *waived* the proposition of joint construction, and substituted another in its place, which has been declined, the question reverts back to the original proposition, and upon this the Canal Company have not, as yet, given a determinate answer. It is, therefore, still to be seen, whether it will refuse the request of Maryland, and use, against the best interests of the state, the powers which the liberality of her Legislature and the decision of her courts have given and decreed. It is yet to be seen, whether the Canal Company will still refuse the reasonable request of the state, depriving a portion of her citizens of the advantages of a choice of markets, and a choice of the modes of conveyance to market, by forcing the Rail road across the river, when the practicability of a joint construction consistent with the interests of both the canal and Rail road, on the soil of Maryland, is proved beyond a doubt. It is still to be seen whether the Canal Company will use the power which one charter of Maryland has given, in good faith, unnecessarily to destroy, if practicable, a body created for the benefit of the citizens of Maryland, by another of her charters; and above all, it is still to be seen whether Maryland, upon whom the Canal Company is still, in a great measure, dependent, will permit the use which may thus be attempted to be made of the powers she has granted—whether the Canal Company will assume this attitude of determined hostility to the sovereign that has created it, may well be doubted, and until this doubt is removed by the reception or rejection of the proposition of joint construction, it is difficult to say what may be the exact course of the future operations of this Board; whether passing into other states it may dispense its benefits there, to the exclusion of Maryland, or permitted to remain on her soil, the road may be suffered to make its contribution to her prosperity. In the mean while, however, the Board feel warranted in assuring the stockholders, that whatever may be the result, the completion of the Rail road to the Ohio river, within a reasonable time, is now considered by them, as secured by the experience and results of that portion, which has been already finished and put in operation.

The Stockholders have already been informed, in the last Annual Report, of the right granted to this company, by the state of Maryland, to construct a lateral Railway to the line of the District of Columbia. The act of assembly, by which this right was granted, received some modification, in its details at the last session of the legislature, making it better adapted to the object in view. During the past year, the surveys have been prosecuted on this route, with unremitting diligence, but as they have not yet been completed, the Board are not prepared to report fully upon their results. The time, which they have occupied, proceeds from the necessity of the most detailed investigations, to arrive at the *data*, requisite to a choice between different locations. To do this, it has become necessary, to make the numerous and extensive surveys that were required as accurately and minutely, as if intended for the immediat guide of the superintendent of construction; otherwise the Board after having determined upon a line, and made the road, migh find that a better route existed, of which a rival company migh hereafter take advantage.

These circumstances, with the fact that only a single brigad is employed on the surveys, will sufficiently account for the d lay, in their completion—although every effort has been mad and is still making, to complete them during the present mont

The Board refer to the reports of the chief Engineer and supe intendents of the several departments into which the affairs of t company have been divided, and which are hereto appended, for a more full and detailed statement of the operations of this company, including the location, graduation and construction of the road, as well as of the machinery and transportation upon it, and the improvements at the several depots.

By the report of the Treasurer also, hereto appended, a full exhibit is likewise furnished, of the entire disbursements of the company, from its first organization to the present time. [See Appendix Document N.]

In concluding their Sixth Annual Report, the Board repeat their assurance to the stockholders of their entire confidence in the final success of the work, in which they are engaged; and it is a source of high gratification to them now, after the first grand division of the Railway has been completed and put into active operation, to be able also to assure the stockholders, that no errors vitally affecting the great interests of the undertaking, whether as regards the location or construction of the road, have been discovered. Embarking, as this company did, in a new and extensive undertaking, involving numerous and complicated details, of which little was then practically known in our country, it could not but be expected but that some mistakes would be made. It is gratifying, however, to know that as regards this company, these mistakes have been few and unimportant, and the Board of Directors look forward with confidence to an increase in the value and profits of the capital invested, proportionate to the increasing wealth and prosperity of the two vast sections of the country, which will, by the road, when completed, be indissolubly united together.

On behalf of the Board,

P. E. THOMAS, *President*

October 1, 1832.

APPENDIX.

[A.]

Office of the Baltimore and Ohio
Rail road Company, 19*th January*, 1832.

Gentlemen:

I have been requested by the directors of this company to communicate with you on the subject of the within resolutions, and I cannot better express the wishes of the Board, than by calling your attention to the resolutions themselves.

The legal controversy which has heretofore existed, having been decided against this company, it becomes necessary for it to select another route, for the further construction of the work in which it is engaged; and it entertains no doubt that the causes of collision which have heretofore existed, being now removed, the subject of the present communication will receive the early and favorable attention of the canal company,

I am, respectfully, &c. &c.
P. E. THOMAS, *President,*
Baltimore and Ohio Rail road Company.

To the President and Directors
Of the Chesapeake and Ohio Canal Company.

"At a meeting of the President and Directors of the Baltimore and Ohio Rail road Company, on the 19th of January, 1832, it was, on motion,

"*Resolved,* That the President of this Company be requested to communicate with the Chesapeake and Ohio Canal Company, for the purpose of ascertaining from them whether any arrangement can be made by which the Rail road may be conducted, jointly with the Canal, as far as to Harper's Ferry, on the North bank of the Potomac, with the view of crossing into Virginia at that place: and also, to arrange with the Canal Company such plan as will be mutually satisfactory for the passage of the Rail road across the Canal, either at Harper's Ferry or at the Point of Rocks, should this last place be selected for crossing the Potomac with the Road.

"*Resolved,* That the President be authorised to propose, as the basis of the arrangement by which the Rail road may be constructed, jointly with the Canal, on the North bank of the Potomac river, as far as Harper's Ferry, the surveys heretofore made by Messrs. Roberts and Knight, and filed in the Chancery Court of Maryland, and that he also be authorised to propose that the whole of the additional expense incurred by the Canal Company, in consequence of such joint construction, be borne by the Rail road Company.

Extracted from the minutes.

JOHN N. BROWN, *Recording Secretary.*

Office of the Baltimore and Ohio Rail Road Company."

[B.]

The President and Directors of the Chesapheake and Ohio Canal Company,

IN MEETING, *March* 10, 1832.

Col. JOHN J. ABERT, from the committee appointed on the 28th January last, made the following report, which was read, and the consideration thereof postponed until Wednesday next:

The undersigned, a committee to which was referred a communication from the President of the Baltimore and Ohio Rail Road Company, enclosing two resolutions of the President and Directors of that company, in the following words:

Resolved, That the President and Directors of this company be requested to communicate with the Chesapeake and Ohio Canal Company, for the purpose of ascertaining from them whether any arrangement can be made, by which the Railroad may be conducted jointly with the canal as far as Harper's Ferry, on the north bank of the Potomac, with the view of crossing into Virginia at that place; and to arrange with the Canal Company such plan as may be mutually satisfactory, for the passage of the Rail road across the canal, either at Harper's Ferry, or at the Point of Rocks, should this last place be selected for crossing the Potomac with the road.

Resolved, That the President be authorised to propose, as the basis of the arrangement by which the Rail road may be constructed jointly with the canal, on the north bank of the Potomac river, as far as Harper's Ferry, the surveys heretofore made by Messrs. Roberts and Knight, and filed in the Chancery court of Maryland; and that he be also authorized to propose that the whole additional expense incurred by the Canal Company, in consequence of such joint construction, be borne by the Rail Road Company.

Respectfully report:

That these resolutions properly divide themselves into two distinct propositions:

1st. The joint construction of the Rail road and canal, on the north bank of the Potomac, from the Point of Rocks to Harper's Ferry, and for the Rail road to cross the river at the latter place; and

2d. To conduct the Rail road across the canal and the river, to the opposite shore of the Potomac, near the Point of Rocks.

After bestowing upon the propositions all the consideration due to their intrinsic importance, as well as to the highly respectable company by which they are made, the committee has come to the conclusion that this Board ought not to agree to the first proposition.

To the second proposition, the committee sees no sufficient objection, provided the crossing can be effected in a manner not to injure the canal, nor to impede its free use, nor to hazard its preservation by the abutments and piers in the river, which the Rail road may require: but it is the opinion of the committee that the place of crossing should be below the "Point of Rocks."

To prevent any misunderstanding on this subject, the committee recommends, that the manner and conditions of crossing the canal and the river, with the Rail road, should be expressed in a written agreement; and also, that the same agreement should provide for the manner of crossing with the Rail road the tributary streams of the Potomac.

The committee, according to the instructions of the Board, consulted the resident engineers of the company, on the local circumstances connected with the subject matter of the resolutions of the President and Directors of the Rail Road Company, and their opinion, as expressed in the annexed report, is decidedly against the joint construction of the two works. These engineers, being actively engaged upon a distant part of the canal line, their report was not received until within a few days past, which circumstance is stated as an apology for the delay in making this report.

J. J. ABERT,
W. SMITH,
PHINEAS JANNEY,
Committee.

March 10*th*, 1832.

Report of the resident Engineers of the Chesapeake and Ohio Canal Company, to a committee of the Board, on the joint construction of the Canal and Rail road.

HARPER'S FERRY, *February* 20*th*, 1832.

GENTLEMEN:

In conformity with your request, we herein present our views on the effects likely to be produced upon the canal, in the event of a conjoint construction with the Baltimore and Ohio Rail Road, from the "Point of Rocks" to Harper's Ferry, and, also, if a viaduct were constructed across the canal and the Potomac below the "Point of Rocks," and the Rail road conducted to and up the southern bank of the Potomac.

1st. In order to permit the construction of the Rail road, conjointly with the canal, it will be necessary to construct the canal further into the Potomac, at all the difficult passes, than if it were made separately; this will increase the amount of walling and embankment, and, by forcing the bank of the canal into the deep and rapid water of the Potomac, much increase the hazard from without, whilst it will be more difficult to render the canal secure from breaches within its banks, the cost must necessarily be augmented, and from the difference that occurs between the prices at which the work has lately been contracted, and those of the commissioners under the decree of the Chancellor of Maryland, it will much exceed their estimate of the difference of cost between an independent and conjoint construction of the canal. We have satisfied ourselves of the accuracy of this statement, by having examined the subject, and made the comparisons, based upon the quantities in their report.

2d. Having disposed of this first proposition, we will now proceed to consider the application for permission to cross the canal, at the Point of Rocks, to the Virginia shore.

We do not perceive that, by the construction of a viaduct across the Potomac, at the Point of Rocks, any injury could result to the works of the canal, from the damming up of either the water or ice, provided a sufficient elevation be maintained. The necessity of providing ample space above the surface of the water in the canal, for boats of the most elevated description, contemplated to be used upon it, will ensure the viaduct an altitude that will effectually prevent the possibility of any injury from the accumulation of ice between its piers.

The height we would recommend, is, that the under side of the arch be at least eighteen feet above the surface of the water in the canal, and that the canal and banks be included in one arch, or span of eighty feet. We are also of opinion that the arches of the viaduct to be constructed across the Potomac should not be less than one hundred and twenty feet span, and of the same elevation as that across the canal.

We have thus briefly given our views on the questions submitted to us, confining ourselves entirely to the consideration of the effects the execution of either plan would probably produce upon the works of the canal.

ALFRED CRUGER,
THOMAS F. PURCELL.

To Messrs. J. J. Abert, W. Smith, P. Janney,
Committee on the Rail road Proposition.

In Meeting, March 14th, 1832.

The Board took up for consideration the Report of the Committee, submitted at the last Meeting, on the communication from the Baltimore and Ohio Rail Road Company, of the 19th January last. The Report was approved and adopted; and it was

Resolved, That a copy of said Report, together with a copy of the proceedings of this Board thereon, be transmitted, by the President, to the President and Directors of the Baltimore and Ohio Rail Road Company.

True extracts from the Journal. Test,

JOHN P. INGLE, *Clk. C. & O. C. C.*

[C.]

Resolutions of the Legislature of Maryland passed December Session, 1831.

Whereas the progress, on the route selected, of the Baltimore and Ohio Rail road Company, one of the great works of internal improvement, in the success of which the State of Maryland is deeply interested, has been suspended at the Point of Rocks, on the left bank of the Potomac river, by a decision of the Court of Appeals of this State, in favor of the claim of the Chesapeake and Ohio Canal Company to the prior right of choice for the route and site of their Canal along the Potomac, which right of choice the said Canal Company have executed by choosing, for the route and site of the Canal, the said left bank of the river:

And whereas the chief engineer of each of the said companies, acting as commissioners, under the direction of the Court of Chancery, and at the mutual request of the said companies, after making the necessary examinations, surveys, and estimates, united in opinion, and reported that it was practicable to construct both the contemplated works through the narrow passes, from a point below, but near the Point of Rocks, to a point at the bridge which crosses the Potomac at Harper's Ferry, by a reasonable increase of expense:

And whereas it is represented to this General Assembly that the Baltimore and Ohio Rail road Company are willing to bear and pay the additional expense, which will be incurred by the joint construction of the said Canal and Rail road from the Point of Rocks to Harper's Ferry, conformably to the said report; and the interest of the State and the public benefit will be greatly promoted by the extension of the said Rail road past the Point of Rocks to the bridge at Harper's Ferry: Therefore,

Resolved, by the General Assembly of Maryland, That it be earnestly recommended to the President and Directors of the Chesapeake and Ohio Canal Company to call a public meeting of the stockholders of the said company, in the manner authorzed by the charter, and submit to their consideration the proposition of the Baltimore and Ohio Rail road Company, for the oint construction of the Canal and Rail road, aforesaid, from he Point of Rocks to Harper's Ferry. And that the agent or person appointed to represent and vote on behalf of the State of Maryland, at meetings of the stockholders of the said Canal

Company, be, and he is hereby authorized to attend at the said meeting and explain the wish and opinion of this Legislature, that such joint location should be assented to by the Chesapeake and Ohio Canal Company, and that the said agent use his best endeavors to obtain such assent, and to have the object of this resolution effected on just and reasonable terms.

We hereby certify that the aforegoing is a true copy of the original preamble and resolution, which passed the General Assembly of Maryland, at December session, one thousand eight hundred and thirty-one.

Given under our hands, this fifteenth day of March, in the year of our Lord eighteen hundred and thirty-two.

JOS. H. NICHOLSON,
Clerk of the Senate of Maryland.
GEORGE G. BREWER,
Clerk House of Delegates of Maryland.

[D.]

Office of the Baltimore and Ohio Rail Road Company, *June* 7, 1832.

At a meeting of the Board of Directors of the Baltimore and Ohio Rail Road Company, held this day, the following resolutions were adopted in regard to the application now pending before the Chesapeake and Ohio Canal Company, for permission to construct the Rail road side by side with the Canal, from a point below the Point of Rocks, on the Potomac river, to the bridge at Harper's Ferry; which resolutions being adopted, the President was directed to have them transmitted to the representative of the State of Maryland in the Canal Company, for the action of the last named body thereupon, subject, however, to such alterations and modifications as may, by future circumstances, be suggested, and as the president may find necessary in the course of any negotiation that may take place.

Resolved, That the surveys, levels, plans, estimates, and report of Messrs. Knight and Roberts, of, and relating to, the conjoint location and construction of the Chesapeake and Ohio Canal, and Baltimore and Ohio Rail road, between the Point of Rocks and Harper's Ferry, made in the year 1830, in pursuance of the order of the chancellor of Maryland, dated the 18th of January, 1830, be proposed as the basis of the agreement for the conjoint construction of the two works throughout the narrow passes, where the collision of the independent locations made by the said commissioners took place; that is to say:

1st. The locations, levels, grades, curvatures, slopes, number, and position, of culverts and walls, and dimensions of partition walls, shall remain the same as contemplated in the said plans and estimates, excepting only, that the position of the partition walls at the lower and upper Points of Rocks may be removed, parallel to itself, a horizontal distance not exceeding five feet, and so that the surface breadth of the water in the Canal shall be 60 feet throughout, and the breadth of the Rail road reduced from 30 to 25 feet, inclusive of half the top breadth of the partition wall. And that a similar movement shall be allowed with respect to the two partition walls and the public road at Miller's Narrows, and likewise at Harper's Ferry Narrows, in order that the surface of the water in the Canal shall also have a width of 60 feet at those places.

2d. The conjoint construction of the Canal and Rail road (the latter so far as to prepare it for the reception of the rails) shall be contracted for and made by the Canal Company, under the superintendence of the Canal engineers, and the inspection of such engineers as the Rail road Company may at any time choose to appoint or direct to inspect or examine the same, in order to guard its interests: the contracts to be the cubic yard for excavation and embankment, and by the perch for walls, and in general to be by such measurements, as nearly as may be, as were employed in the estimates made by the said commissioners; and the measurements and accounts shall be so made and kept as to show the dimensions, quantity, and cost, of the whole work to be performed, and of each part and kind of work distinctly and separately.

3d. The parts and extent of the Canal and Rail road, respectively, to be so conjointly constructed, to be the same as estimated by the said commissioners, that is, at the lower Point of Rocks 3,023 feet in length of canal, and 3,427 feet in length of Rail road: at the upper Point of Rocks 2,133 feet of canal, and 3,107 feet of Rail road: at Miller's narrows 3,052 feet of Canal, and 3,500 feet of Rail road, together with the public road: and at Harper's Ferry narrows 1,126 feet of Canal, and 1,100 feet of Rail road, and also the public road.

4th. All proposals for conjoint construction, as soon as approved by the Board of president and directors of the canal company, shall, as soon as practicable, be submitted to the Board of president and directors of the Rail road company, when, if the latter also approve, written contracts shall be entered into by the canal company, without delay. Each Board shall decide upon any such proposal within ten days after the same shall have been presented to the president.

5th. Immediately after the contracts shall have been entered into as aforesaid, for the conjoint construction at the lower Point of Rocks, the engineer who is to superintend the construction on the part of the canal company, or such engineer as that company shall appoint, and the superintendent of graduation and masonry, or such engineer as the Rail road company may appoint, shall revise the estimates of Knight and Roberts aforesaid, for the lower Point of Rocks, and shall re-make the said estimates, by applying the actual contract prices, so having then been recently entered into, to the estimated dimensions and quantities employed in the estimates of the said commissioners, (correcting for the change in the position of the partition wall) and taking care to supply any defects in quantity or kind of work which they may discover in the same, in order that the corrected estimates shall be as perfect as possible. In this manner shall the estimates not only on the independent lines, but likewise on the conjoint lines, be corrected for both works, by which it will appear how much the canal, and also the Rail road, will cost on their independent locations, as well as on their conjoint locations, and likewise the amount of the excess of cost of the construction on the conjoint locations beyond that of the independent locations, *according to the contract prices.*

6th. Upon the monthly or regular estimates for work done, each company will pay an amount proportioned to the probable final payment, or whole cost of its part of the work, as indicated by the corrected estimates before mentioned.

7th. Inasmuch as failures on the part of contractors to comply with their contracts may take place, in consequence of which, as well as by reason of other casualties or contingencies, the actual cost of construction may vary from that of the aforesaid corrected estimates, it will be necessary, when the work is completed, to make a final adjustment of all the said estimates, so as to make them conform to the prices *actually* paid, and so as to include every proper charge, by which it will appear how much the conjoint construction of the canal and Rail road has cost more than the amount of both would have been on the independen lines; and the Rail road company shall pay to the contractors and to the canal company, such sums as shall amount in the whole to the excess of the cost of the conjoint construction o both works over the probable cost, or last corrected estimate a aforesaid of the canal, on its independent location, and so tha the canal company shall pay in the whole no greater sum than i the canal had been constructed upon the line of its independen location, made without any regard to a Rail road.

The same rules and proceedings, in every respect, and th like proportions and relations of payment shall be observed an complied with as regards the conjoint construction at the uppe Point of Rocks, at Miller's narrows, and at Harper's Ferry na rows.

9th. The culverts for the Rail road are to be located and mad as shall be pointed out by the engineer, on the part of the Ra road, the top stones of which shall not extend within one foot the graduated surfuce of the Rail road, nor shall any one stor or rock, of greater diameter or thickness than six inches, be admitted into any filling or embanking of the Rail road, so as to occupy a space within one foot of the graduated surface.

10th. The remaining parts of the location of the canal, and also of the Rail road, between the lower and upper Point of Rocks, and between the latter and the little Catoctin creek, and likewise, between Miller's narrows and Harper's Ferry narrows, shall remain as the same were located, or recommended to be located, by the said commissioners; each company constructing its own work of the full breadth, excepting that the berm of the canal may be reduced from eight feet to three feet in such places as will render greater economy in the construction of either work.

11th. Each company to locate and construct its own work, independently of the other, of full breadth and full berm, from the little Catoctin creek to Miller's narrows, a distance of seven miles, more or less.

12th. The Rail road company shall provide, at its own expense, wherever required by the said canal company, crossing places over the said Rail road, so as to permit the free and uninterrupted access of persons and produce to the said canal, along the space herein before mentioned as the limits of the parallel construction of the two works.

Extracted from the minutes.

JOHN N. BROWN,
Recording Secretary.

[E.]

WASHINGTON, (*Gadsby's*) *July* 13, 1832.

DEAR SIR:

I have considered of, and consulted with those best informed, and most interested in, the passage of the Rail road along the Point of Rocks, upon the inquiry by General Jones's motion of reference, on Wednesday last, in the Canal meeting. Before I speak of the conclusion to which my mind has been brought on the subject, permit me to say, that, although I could not object to any inquiry, I did not, before its passage, understand that the resolution would bear the precise shape which it has assumed.

As to the plan suggested by the resolution to which I have referred, I am convinced that the difficulties of acting under it are so numerous and serious, not to say insurmountable, that the Rail road Company would save, in expense and time, by constructing an independent road on the land side of the Canal.

Notwithstanding I feel most anxiously for the success of the proposition of the Rail road Company, heretofore submitted by me to your committee, from the earnest desire which you signified, and, I am sure, felt, on Wednesday, to advance, as well the interests and progress of the Rail road as the Canal, I am induced to offer to your committee, and, through it, to the stockholders, a new and distinct proposition, in which I am authorized to pledge the concurrence of the Rail road Company.

I enclose the proposition, under a conviction that it will be well and fairly considered by the committee, and a hope that its terms will be found so liberal, that it will, at once, be assented to, and recommended to the adoption of the stockholders.

The important and numerous advantages to be secured to the Canal Company, by their acceding to this proposition, are so obvious, that they need not be presented to you by me.

I wish it understood, that the former proposition is not withdrawn, but that this is submitted as an alternative, in the event of the terms of the former being considered inadmissible.

If it be thought that I can be of any service by attending the committee, I shall be pleased with an opportunity of meeting them.

I am, dear sir, very respectfully, your obedient servant,

B. S. FORREST.

Richard S. Coxe, Esq.
Chairman of Canal Committee.

PROPOSITION.

As the agent of the State of Maryland, representing its Canal stock, and its wishes on the subject of the contemplated compromise between the Canal and Rail-road Companies, I propose that the Rail-road Company shall undertake to construct the Canal, of its full width of sixty feet, and its full depth of six feet, upon the location for joint construction made by Knight and Roberts, at the narrow passes between the Point of Rocks and Harper's Ferry, for the sum which the Canal, as located at this time, is estimated to cost under the present contract prices, to be paid twice a month, or monthly, by the Canal Company to the Rail-road Company, in such sums as the engineer of the Canal may estimate: and the Rail-road Company shall stipulate to finish the said Canal, on or before the first day of December, 1833, and shall guarantee it to stand, and keep it in repair for the term of five years after its completion.

B. S. FORREST.

July 13, 1832.

Note.—If difficulty may be apprehended in consummating the agreement in detail, of which the aforegoing is proposed to be the basis, no objection will be made to the appointment of an umpire at this time, to be chosen by the two companies, who shall finally settle the details of the arrangement proposed, and all other questions which may arise under it, between the companies.

[F.]

The Stockholders of the Chesapeake and Ohio Canal Company.

IN MEETING, SATURDAY, *July* 14*th*, 1832.

Col. GEORGE BOMFORD submitted the following preamble and resolutions:

Experience having demonstrated that the early accomplishment of an intercourse between the Chesapeake and Ohio, whether by canals or Rail roads, requires the resources of all its friends in one common plan:

Resolved, As the sense of this meeting, that it is highly desirable that the Chesapeake and Ohio Canal and Rail Road Companies, instead of applying their means and efforts to different, and, in some respects, rival schemes, should concentrate them on one common object of acknowledged and equal utility to the respective interests affected by it.

That a canal, if not the only practicable, is unquestionably the cheapest mode of transporting lumber and coal, the toll on which will transcend those on all other articles.

That, if the division of the resources of the two companies should, by possibility, have the effect of frustrating the canal, and the Rail road should, as it probably would, yield little or no profit on the transportation of these articles, the apprehension of this result must either defeat the Rail road altogether, or, if effected, will render almost totally unproductive the immense capital required for its accomplishment; whereas, should the canal be speedily made from the Point of Rocks to Cumberland, and as soon thereafter as practicable to its western termination, every article of commerce may be transported down it to the Point of Rocks, at such an anticipated profit to the company, as at once to ensure the requisite funds, and to render them productive; the more especially as, should the whole transportation be by the canal to the Point of Rocks, instead of being in part by the canal, and in part by the Rail road, such profit will be sure and great, instead of being, as it might be in the contrary event, precarious and trifling.

That, considering the large subscriptions made before the Rail road was thought of, by the corporations and individuals of the District, amounting to about two millions of dollars, constituting more than a tenth part of its entire property, and which, having been principally borrowed, must, at no remote date, be repaid, and which, until repaid, operates as an annual tax of at least one hundred thousand dollars, any measure, which should operate either to frustrate or impede the canal, or to shake public confidence in its success and productiveness, would be, in the highest degree, not merely prejudicial to their interests, but likewise fatal to their permanent prosperity, by depriving them of the credit essential to raising the funds requisite to its completion.

Resolved, therefore, That the following propositions, as best fitted to compromise, on principles of justice and reciprocity, all the interests involved, be submitted to the Rail Road Company:

1. That the Rail road, for the present, terminate at the Point of Rocks.

2. That the right of the Rail Road Company to extend the road, after the completion of the canal to Cumberland, and subsequent to the year 1840, be reserved.

3. That, in the mean time, the resources of the two companies be united, and directed to the vigorous completion of the canal to Cumberland, and thence to the Ohio.

4. That the requisite legislative provisions to carry this object into effect be applied for by the two companies.

5. That the dividends on the stocks of the two companies be made *pro rata* out of the net proceeds of the tolls derived from the canal and Rail road.

6. That in case the Rail Road Company should declare its assent to the foregoing terms, either as they now stand, or with any necessary modifications, that a committee of three members of this company be appointed by the President and Directors, to meet a like committee of the stockholders of the Rail Road Company; and the said joint committee be, and they are hereby, authorized to make and execute a definitive plan and compact between the two companies, for the purpose of carrying the foregoing propositions into effect.

On motion, by RICHARD S. COXE, Esq. it was

Resolved, That the preamble and resolutions just offered, together with that previously offered by ANTHONY C. CAZENOVE, Esq. be referred to the committee appointed on the 28th of April last, on the resolution of the General Assembly of Maryland, relative to the joint construction of the Rail road and canal.

The Stockholders of the Chesapeake and Ohio Canal Company.

IN MEETING, SATURDAY, *August* 4, 1832.

RICHARD S. COXE, Esq. from the committee to whom the various propositions were yesterday, and on the 11th July last referred, made the following

REPORT:

The committee appointed on the 28th of April last, having taken under consideration the various subjects referred to them since the date of their report of June 16th, beg leave to submit their views in this supplemental report:

In regard to the propositions offered to the Chesapeake and Ohio Canal Company, by, or on behalf of, the Baltimore and Ohio Rail Road Company, this committee has, in its report of the 16th June, submitted its views upon the general principles which these propositions involve. The meeting of the stockholders has intimated no dissent from these opinions; and, notwithstanding the changes which have occurred in the constitution of the committee, no disposition has been indicated to vary, in any one important particular, from that report.

In considering, therefore, the new subjects referred to it, the committee, as well from the dictates of its own judgment, as from the implied assent given to its views by the general meeting, has not thought it encumbent to add any thing to the reasonings of the former report. It has been assumed, that it speaks the language and sentiments of the company at large.

The committee cannot forbear from an expression of its deep sense of the importance of the questions now submitted to the deliberate consideration of the general meeting of the stockholders. The points originally in controversy, between the Chesapeake and Ohio Canal Company and the Baltimore and Ohio Rail Road Company, in themselves interesting and important, have become doubly so by the anxiety they have awakened. Every citizen of the community has participated in this feeling. The members of the legislative bodies to which each company is so deeply indebted, have expressed a deep solicitude in the question; and, in particular, that of Maryland, the common parent of both, has exercised its parental influence to produce harmony of feeling, and union of action, among its offspring. This committee will not affect to disguise its sense of the heavy responsibility devolved upon it. We entertain a deep solicitude, not only that the opinions we may express, and the measures we may recommend, may be in themselves just and right, but that they may recommend themselves to the judgment of all who may feel an interest in the subject.

It appeared perfectly obvious to the committee, that it must at once occur to every individual, that the mere circumstance of close contiguity between two such works of internal improvement, could be productive of benefit to neither. It could not, in any particular, enhance the value of the Canal, that a rival enterprize was constructed immediately upon its margin, and it is equally obvious, that no stockholder in the Rail road would feel that his interests were promoted by a contiguous canal. The most sanguine anticipations of the future growth and prosperity of our country must postpone, for many years, the period when it will exhibit such an accumulation of commodities, and such an increase of business, as will furnish full employment to both works. In the indefinite interval, all the produce which will descend the valley of the Potomac, may conveniently be transported on either of these channels of communication, while all the commodities supplied from the seaboard, for the consumption of the interior, must, as is equally obvious, afford much less than full employment to either work. Their proximity to each other limits them to the same range of country.

Without instituting any comparison between the two important projects, or endeavoring to ascertain their relative value as means of intercourse, points upon which great diversities of opinion prevail, it must be sufficiently obvious that, if each of them, separately, possesses the capacity to perform all the business which the country requires, the proximity of a rival enterprize cannot but be pernicious in its influence. If they hold out equal inducements to the merchant and the farmer, they will share, in the same proportion, the business which is to be performed. Ruinous competitions to engross the whole, or an undue proportion, of the transportation, may be confidently anticipated, and the two companies will inevitably find themselves occupied in useless and unprofitable, if not destructive collisions. Inadequate profits upon the large amount of capital invested will speedily induce neglect, and neglect will rapidly hurry both to destruction. Should experience demonstrate the decided superiority of either over its rival, the deterioration in the value of the less fortunate, because less useful, undertaking, may prompt to self-immolation, as the means of involving both in one common ruin. Fairness and liberality on both sides, with an equal participation in the entire trade, must render the stock of each unproductive to the proprietors.

With these views, which to the committee appear undeniable and incontrovertible, we cannot but regard the project of carrying on the two works, in immediate contact with each other, as calculated seriously to impair the utility and value of both. So long as they are in juxtaposition, all the business performed by one would substantially be so much subtracted from the other, and an application to either, voluntarily to permit the rival work to be carried along its side, does appear to the committee an application to inflict upon itself an enormous, if not a vital injury.

Can it for a moment be credited that a single stockholder of either company, with any view to derive a return from his investment, would ever have affixed his name to the subscription list, if the original plan had contemplated the immediate proximity and close contiguity of the rival enterprize? Is one to be found, so confident in the absolute superiority of the work with which he is connected, as not to see, to feel, and to acknowledge, that its value would be essentially impaired by the circumstance that another medium of communication lay in actual contact with his own?

Strongly impressed with the accuracy of these views, the committee is unhesitatingly and unanimously of opinion, that the true interests of all parties imperiously demand that the idea of carrying on both Canal and Rail road beyond the point of junction should, at least for the present, be abandoned. In this opinion, they confidently anticipate the cordial concurrence of the intelligent stockholders of the Rail Road Company. It is visionary to anticipate, within any moderate period of time, that sufficient occupation should be furnished to both; and should that period happily arrive, the work temporarily postponed may be executed under circumstances far more auspicious than those which at present exist. Under present circumstances, we apprehend it will not be controverted that, if the superiority so confidently claimed by our rivals be adjudged to them by the results of experience, the concession, under any terms, of the right to construct a road in immediate contact with the canal, would be suicidal. Should their anticipations not be realized, the injury which would necessarily result to us, would not be alleviated by the consideration that our less fortunate competitor had sustained losses still more destructive.

Under a deep conviction that these views are as sound as we know them to be sincere, the committee is unanimously of opinion that the resources and strength of both companies, to complete the canal beyond the Point of Rocks, is demanded by every consideration, as well of public as of private interest. The construction of a basin of competent dimensions at the point of junction, with suitable facilities for the loading and unloading of boats, would secure to each party an equal interest in all the work above. If experience shall demonstrate that either plan is superior to the other, the effect will be obvious, and the advantages will be experienced below the point of divergence. Whichever shall find itself occupying an attitude of inferiority may still discover topics of consolation in the reflection, that important public benefits have compensated for individual losses. The committee therefore recommend that the preamble and resolutions submitted yesterday, by colonel Bomford, be adopted, with such a modification of the *fifth* resolution, as shall more distinctly provide that, above the Point of Rocks, the canal shall be executed as a joint concern, and the profits distributed according to the contributions of the two parties, while the Rail road from thence to Baltimore, and the canal to the district, shall remain separate and distinct in interest. The committee will refrain from suggesting the details of the compact, which ought to be framed with great care and circumspection, in the manner contemplated in the sixth section resolution.

The committe cannot refrain from indulging the hope that the unfortunate and unprofitable controversy which has so long subsisted between the two companies may now be adjusted in the manner which has been proposed. They would willingly postpone even an expression of opinion upon the other subjects referred to them. But, under the instructions they have received, this would be irregular, and they feel called upon to present their views, although no immediate action on them by the company is required.

In regard to the proposition particularly referred to the committee, on the 11th July, which contemplated that the Rail road should be permitted to cross the Canal at the Point of Rocks, and be extended along the Canal on the river side to Harper's Ferry, though not free from serious objections, it is probable that such a plan might be so modified and guarded as to induce the canal company so far to yield, in a spirit of compromise. The proposition was presented under so imposing a weight of authority, as to command the most serious consideration; but all hopes of its serving as the basis of an eventual and satisfactory arrangement were destroyed by the early annunciation, from the representative of Maryland, that it would not be acceded to by the Rail road Company.

The committee will therefore content themselves with an expression of their regret that a suggestion emanating from so high and impartial a source, and which promised such auspicious results, should be disclaimed *in limine* by the party which is asking for concessions.

The proposition submitted by the representative of Maryland, by way of substitute, or alternative, contemplates the conjoint construction of the two works between Harper's Ferry and the Point of Rocks, upon the basis of the report of Knight and Roberts. The committee have already submitted their opinion that such a construction would be replete with injury to the canal company, and they are unable to perceive, in the unessential modifications in the details of the plan now before them, any thing which is calculated to guard against, or compensate for, the positive evils which they apprehend to be inevitable.

The committee concur in recommending the adoption of a resolution, requesting the president and directors to make application to congress, and the several other parties to the charter for such additional subscriptions to the stock of the company as will ensure the speedy and efficient prosecution of its works to the coal banks above Cumberland; but entertaining a decided opinion that no reasonable doubts can exist upon the subject of a forfeiture of the existing charter, they deem it inexpedient an unnecessary to present this subject to those authorities.

Signed on behalf of the committee,

RICHARD S. COXE, *Chairman, &c*

The adoption of the report being under consideration, Benjamin S. Forrest, Esq. offered the following resolution, as a substitute therefor:

Resolved, That it is expedient and proper to accede to the wishes and recommendation of the state of Maryland, expressed in a preamble and resolution, passed by the general assembly of Maryland, and referred to a committee by the stockholders of the Chesapeake and Ohio canal company, in meeting on the 28th of April, 1832; and the president and directors of the canal company are hereby required, as soon as possible, to enter into such reasonable agreements and contracts with the Rail road company, as may be necessary for passing the Canal and Rail road along the narrow passes between the lower Point of Rocks at Harper's Ferry.

Benjamin L. Lear, Esq. moved to amend the substitute offered by Mr. Forrest, by striking out the words "the wishes and recommendation of the state of Maryland, expressed in a preamble and resolution passed by the general assembly of Maryland, and referred to a committee by the stockholders of the Chesapeake and Ohio canal company, in meeting on the 28th of April, 1832," and inserting the words, "the proposition of the Baltimore and Ohio Rail road company."

The motion to amend was agreed to.

The question was then put upon the adoption of the substitute, as amended, and it was lost. Ayes 1,423, noes 7,962.

Benjamin S. Forrest, Esq. then proposed to strike out the report of the committee, and insert the following resolutions:

Resolved, That it is hereby made the duty of the president and directors of the Chesapeake and Ohio canal company, to agree with the president and directors of the Baltimore and Ohio Rail road company, for the construction of the Canal, with its full width of sixty feet, and its full depth of six feet, upon the location for joint construction made by Knight and Roberts, at the narrow passes between the Point of Rocks and Harper's Ferry, provided the said Rail road company will do the same for the sum which the Canal, as located at this time, is estimated to cost, under the present contract prices, to be paid monthly, by the Canal company, to the Rail road company, in such sums as the engineer of the Canal may estimate; and provided, also, that the said Rail road company shall stipulate to finish the said canal, by or before the period at which the canal company shall be prepared to introduce water in the canal for navigable purposes, from the feeder next above Harper's Ferry, and guarantee the Canal so made by said Rail road company, to stand, and to keep it in repair for the term of five years after its completion.

Further Resolved, That, before the said agreement shall be entered into, an umpire shall be appointed by the two conpanies, who shall finally settle any details necessary for effectuating the agreement mentioned in the aforegoing resolution, and all other questions which may arise under said agreement between the two companies.

Richard S. Coxe, Esq. moved that the question be divided, and the question was put upon the motion to strike out the report; which was disagreed to.

William M. Stewart, Esq. proposed to add to the report the following:

The stockholders of the Chesapeake and Ohio canal company having had under consideration the resolution of the legislature of Maryland, advising and recommending the assent, on the part of this company, to the proposition of the Baltimore and Ohio Rail road company, for the joint construction of the Rail road and Canal, from the Point of Rocks to Harper's Ferry:

Resolved, 1st. That the object of the Canal Company being, as declared in their charter, "to extend and multiply the means and facilities of internal commerce and personal intercourse between the two great sections of the United States," it is not the wish or intention of this company to retard or interrupt the progress or construction of any other work, having a similar object in view.

2d. That the deep and immediate interest which Maryland has in all works of internal improvement within her borders, and the liberality which she has shown to this company, renders any request on the part of that state especially worthy of consideration.

3d. That, in order to promote the cause of internal improvement, propitiate all parties, manifest a disposition to yield to the wishes of the state of Maryland, and by establishing a good understanding between the two, create such an union of interests as will be mutually beneficial, the proposition of the Rail road company, as made through the agent of the state of Maryland, be accepted, and the president and directors are hereby authorized and directed to carry the agreement into effect.

John Marbury, Esq. demanded the previous question; and the call being sustained by the meeting, the question on the adoption of the report of the committee was put and carried. Ayes 7,961; noes 1,415.

The foregoing are true extracts from the proceedings of the stockholders of the Chesapeake and Ohio Canal Company in general meeting. Attest,

JOHN P. INGLE,
Secretary of the meeting.

[G.]

OFFICE OF THE BALTIMORE AND OHIO
RAIL ROAD COMPANY, *August* 23, 1832.

The President and Directors of the Baltimore and Ohio Rail Road Company, having considered the propositions of the Chesapeake and Ohio Canal Company as exhibited in the extracts from their proceedings of the 3d and 4th of August, 1832, and communicated to this Board, the following resolutions were unanimously adopted, viz:

1*st*. ***Resolved***, That this Board representing the Baltimore and Ohio Rail Road Company, and the great interests connected therewith cannot accept the said propositions, because they require, as a basis, that the extension of the Rail Road be suspended, at "the Point of Rocks," a measure, which, if acceded to, might be destructive of this work, as a continuous line of communication between the navigable waters of the Chesapeake bay and the Ohio river, whilst its early completion, according to the original plan is not only to the Stockholders represented by this Board, but to the state of Maryland, and even to the United States an object of deep and vital interest: this Board therefore, whilst sustained by their Stockholders and by the state of Maryland, will never relax in their efforts, nor be diverted from their purpose, until this great national enterprize shall be accomplished.

2. ***Resolved***, That this Board entertain an undiminished confidence in the ultimate and complete success of Rail Roads, and particularly of the enterprize in which they are engaged, and that they do not concur in, nor admit the correctness of the opinion advanced by the Chesapeake and Ohio Canal Company, that canals are "the cheapest mode of transporting lumber and coal;" on the contrary, the experience of this Board has furnished abundant proof that Rail Roads afford superior advantages and facilities over canals, for the transit of commodities generally, as well as of passengers, both in winter and summer, and that this superiority will ensure a preponderance in the scale of general utility.

3. ***Resolved***, That it is the opinion of this Board, even if a canal should be constructed, the wants of the community, and the interests of the state of Maryland, as well as of the western country will imperiously require *a Railway connecting the Ohio River, with the tide waters of the Chesapeake Bay, as a speedy, economical and convenient channel of intercourse, available at all seasons of the year, uninterrupted, either by frosts or droughts*, and that whatever may be the effect of the completion of both

works upon the profits of the capital invested in either of them, this Board do not fear the competition, nor can the public by having a choice of markets, and modes of transportation, fail to be gainers.

4. *Resolved*, That whilst this Board, therefore, entertained no doubt, but that the superior facilities and advantages of the Railway would ensure its ultimate preference, and extension to the Ohio river, yet as the right of a choice of way, had been adjudicated to the Canal company, along the left margin of the Potomac, and it had been fully ascertained by careful examinations and surveys, made by the Engineers of both companies, acting under their separate instructions, as well as under instructions from the Chancellor of Maryland, that there was sufficient space for both works between the Point of Rocks and Harper's Ferry, and as it was also believed, that the country beyond Harper's Ferry afforded an alternative of routes for the Rail Road in several directions without collision with the Canal, this Board did limit their application to the Canal Company, to a grant of passage for the Rail Road along side of the Canal, so far only as to Harper's Ferry. In this application, the legislature of the state of Maryland have joined, and have requested the action of the Canal thereon, but in the proceedings of the canal company communicated to this Board, it does not appear that these propositions have been acted upon definitively, and as the proposals now received from the canal company appear to be independent of these propositions, and for the reasons herein already stated with others that might be offered, cannot be accepted by this Board, it is therefore further resolved, that the Chesapeake and Ohio Canal Company be requested to consider and pass upon the proposition which this Board has already made to them, or if they shall prefer it, to consider and decide upon the alternative proposition, made with the approbation of this Board, by the agent of the state of Maryland, representing the interest of that state in the meeting of the canal company.

5. *Resolved further*, That should the canal company adopt either of the foregoing propositions, already referred to them on behalf of this company as aforesaid, either in terms or with modifications, looking to an extension of the Rail Road, without delay, along side of the Canal above the Point of Rocks, to a point at the bridge, opposite to Harper's Ferry, (from whence it may be continued without collision with the Canal) on the plan of Knight and Roberts, with such variations as may be desired and agreed upon by the two companies, that then this company will appoint a committee to meet such committee as the Canal company may appoint for the purpose of mutual and satisfacto-

ry arrangement and adjustment of the terms, conditions, and agreements involved in the premises.

6. *Resolved*, That a copy of the foregoing resolutions be transmitted to the Canal company, and also to Benjamin S. Forrest, Esq. agent of the state of Maryland.

Extracted from the minutes.

JOHN N. BROWN,
Recording Secretary.

[H.]

Third Annual Report of the Chief Engineer of the Baltimore and Ohio Rail Road.

Engineers' Office, Baltimore
and Ohio Rail Road.
Baltimore, Oct. 1, 1832.

To PHILIP E. THOMAS,
President of the Balt. & Ohio Rail Road Co.

IN presenting the Third Annual Report of this department, in compliance with the regulations of the company, I have the gratification to state, that the work has generally progressed to the extent contemplated in the last Report, and with a speed and economy beyond the calculations then made, especially in the construction of the Railway, and of the machinery to move upon it; and that the travelling and tonnage upon the road have become great, and are increasing, so that no doubt remains of the complete success of this noble enterprize.

The interruption which has occurred, in the advancement of the location and construction beyond the "Point of Rocks," owing to collision with the Chesapeake and Ohio Canal, and which it is hoped, will only be temporary, has necessarily curtailed the exten of our operations, and, consequently, of the details which otherwise would have been made in the reports of the present year So far, however, as these operations have, and may be, extended, they will be noticed under the usual and appropriate heads

The Graduation and Masonry.

At the time of the last Annual Report, all the contracts f graduation and masonry had been nearly completed, with b few exceptions; and by about the 1st of November last, no remained to be performed between Baltimore and Frederick a the Point of Rocks, excepting the Marble rock excavatio situated 2½ miles from the latter point, and which has been finis ed within the present season.

The report of Caspar W. Wever, Superintendent of gradu tion and masonry, will contain the necessary details on th branch of the service.

The Construction of the Railway.

In this department of the service, the operations have also been carried on during the past year with due speed and economy in every respect. The expectation was entertained in the last Annual Report, that the Railway would be so far laid by the close of the year 1831, as to be open for travel from Baltimore to Frederick, and to the Point of Rocks, at the Potomac. Such was the industry employed, however, that the entire line to Frederick city was formally opened on the 1st day of December last, and has since been in constant and profitable use. Owing to the uncommon severity of the winter, which set in about the 20th of November, and continued, without relaxation, through the residue of the year, the completion of the 1st track on the 5th division, between the Monocacy and the Point of Rocks, was not effected within the year 1831. The process of laying the rails was resumed at the opening of the present season, and two continuous tracks are now completed from the Depot at Pratt street, to the western bank of the Monocacy, a distance of 56½ miles, and a single track thence to the Point of Rocks, 11⅛ miles further, with about ¾ mile of the second track, together with 3½ miles of single track on the branch to Frederick, with 1 mile of sidings, in all 129¼ miles of single track laid upon 71 miles of road graduated throughout for two tracks. In addition, the company have laid a single track of Railway from that Depot into the city of Baltimore, and along Pratt street to the basin, and thence to the city block, a distance of 1¾ miles.

Of the 129¼ miles of single track, $89\frac{55}{100}$ miles are laid upon wood strings and sleepers, at an average cost of \$$4,426\frac{81}{100}$ per mile—$5\frac{83}{100}$ miles upon wood string and stone blocks, at \$$5,457\frac{51}{100}$ per mile—and $33\frac{84}{100}$ miles upon stone sills, at \$$7,193\frac{14}{100}$ per mile—inclusive of turnouts, and \$$409\frac{73}{100}$ per mile for horse path.

During the progress of the laying of the rails, there has been an evident increase of economy, both as respects the cost and improved quality of the work; and I have the gratification to state, that the actual cost of the two tracks of Railway on the main line from Baltimore to the Point of Rocks, and of the single track on the branch to Frederick, inclusive of turnouts, sidings, and horse paths, in all 139½ miles of single track, will have been \$$93,934\frac{70}{100}$ or $673 per mile, less than the estimate made and stated in the last annual report. This saving is mainly to be attributed to the vigilance of the Superintendent of construction and his Assistants, and to the experience which they had acquired during the progress of the work, as well as to the riper experience of contractors and workmen, in a branch of business which, until quite recently, was altogether new to them: and it may not be altogether out of place here to remark, that such is now the organization and experience of the several departments in the service of this company, including that of the superintendent of graduation and masonry; the superintendent of construction of the Railway; the superintendent of machinery, &c.; that there can be no doubt that 50 miles of Rail road per annum, could be constructed from the Point of Rocks towards the Ohio, with equal economy, and probably at no greater rate of cost than has occurred between Ellicotts' Mills and the Point of Rocks; even a temporary suspension of the work at the latter place, cannot therefore, but be regarded as a public loss.

Materials are on hand, seasoning, ready to be used in laying down the second track from the Monocacy to the Point of Rocks, whenever it shall be deemed expedient, and the work can be performed in the course of one month from the time when it shall be commenced.

In those parts of the Railway where the iron rail was laid upon wood, thin wrought iron plates were introduced under the ends of the rails to counteract their tendency to sink into the wood from the pressure of the car wheels upon them: but this precaution was not taken where the rails were laid upon stone sills, from a belief that the resistance of the stone would be sufficient without the aid of the plates. Experience however, has shown the error of that omission, and accordingly, plates have likewise been introduced under the ends of the rails upon the stone sills.

For a more detailed account under this head, I refer to the minute and able report and statements of James P. Stabler, Superintendent of construction; and to the report of Jacob Small, Esq. Architect, for an account in relation to the depots.

The cost of the construction of the main stem of the Baltimore and Ohio Rail Road, from Baltimore to the Point of Rocks. a distance of $67\frac{5}{8}$ miles, may be set down as follows:

Actual disbursements in the department of graduation and masonry, for the graduation, masonry, and bridging - - -		$1,090,666.12
For right of *way*, materials, repairs of county and farm roads injured, &c. &c. - -		25,744.07
For salaries, instruments, and various other contingencies, - - - -		34,638.35
For a quantity of lumber, tools, &c. [see last Annual Report, page 111.] - -		10,881.69
For right of *way*, paid by other officers of the company,	$11,240.17,	
Deduct for right of way on lateral road to Frederick,	$528.	10,712.17
Add for right of *way* not yet paid,		1,363.2

Actual disbursements in the department for the construction of the Railway, in perfecting the graduation and masonry, by widening cuts, securing and strengthening banks and walls, raising embankments after settling, opening drains, building culverts, excavation and masonry of chambers, at the heads of the inclined planes, &c. $53,126.32,	
Deduct this sum, charged for right of way, and included in the fifth item of this statement, - - - - $500.	52,626.32
For iron, wood, stone, workmanship, salaries, and contingencies in the construction of a double track of Railway to the Monocacy 56$\frac{1}{2}$ miles, costing $600,028,$\frac{21}{100}$, and in the first track, thence to the Point of Rocks, 11$\frac{1}{8}$ miles further, $49,248,$\frac{26}{100}$, to which add as estimate for the second track on these 11$\frac{1}{8}$ miles, $49,248$\frac{26}{100}$, and the total for a double track from Baltimore to the Point of Rocks, will be	698,524.73
Add the estimated cost of machinery to be placed at the inclined planes at Parr's ridge, $40,000, and amount expended in the frame work in chambers, $9,034.23, - -	49,034.23
Total,	$1,974,190.95

Being an average of $29,193$\frac{21}{100}$ per mile. Of the total amount, about the sum of $62,000 has not yet been expended.

The Location of the Route.

Circumstances already alluded to, have for the present, prevented the location being carried beyond the first point of collision with the route of the Canal, at the Point of Rocks: to this place the location was completed the preceding year as detailed in the last annual report. Negotiations have for some time been pending between the two companies, and at the request of the state legislature, for terms embracing the privilege of conducting the Railroad along side of the Canal, between it and the rocky and narrow passes to a point at the bridge, opposite to Harper's ferry, but I am not aware that these have yet finally terminated. Should the issue be adverse to the application, it will be incumbent on this company in the prosecution of their enterprise towards the terminus originally designed—the steam boat navigation of the Ohio, to seek a route that shall not clash or be co-incident with that of the Canal, as the same has been adjudicated. The twelve miles between the Point of Rocks, and Harper's ferry, being common to all the practicable routes that may exist from thence to the Ohio, renders it of the first importance that the Rail road should be conducted through that common space to Harper's ferry, from whence it may, without collision with the designated route of the Canal, pass to Cumberland along the right shore of the Potomac, or otherwise take the route of the Shenandoah. Until a pass is found, however, to Harper's Ferry, no certain or decisive conclusion can be safely made upon the proper route afterwards to be pursued. This point is the key to all the feasible routes westward of it, and, the instant it shall be reached with the Railway, will command the trade and intercourse of the long and fertile valley of the Shenandoah on the one side, and on the other of that of the Antietam and Connecocheague. The accession to the trade and intercourse upon the Railway, that will accrue from reaching Harper's Ferry, will doubtless justify any expenditure that may be required to overcome all the obstacles that shall be found to intervene upon these twelve miles. The alternatives are several, in case the Canal Company shall finally negative the propositions made to them. Either the Rail road may be made to cross over the canal and the Potomac river upon an extensive viaduct, to be erected for that purpose, near to the Point of Rocks, and thence up on the Virginia side of the Potomac, and across the Shenandoah to Harper's Ferry; or, which will probably be better on several accounts, it may be made on the same side of the river with the Canal by excavating a shelf in the face of the rocky cliffs which form the narrow passes, or by tunnelling one or two of the mountain spurs at no great distance from the route of the canal, or lastly, passing with a single tunnel, a depressed and narrow pass of the mountain at a greater distance from the river, and where the one tunnel would pass both the Lower and Upper Points of Rocks which are two projections from the one mountain. From thence the route could still be conducted, without collision, with the Canal along the sloping basis of the hills, and probably for several miles on the bottom lands to Miller's Narrows 2½ miles below Harper's Ferry, and 7½ miles above the upper Point of Rocks. These narrows, as well as those in the immediate vicinity of the bridge at Harper's Ferry, it is believed, can be passed by encountering some heavy rock excavation. With the foregoing views I respectfully recommend, that, in case of an adverse decision of the Canal Company, surveys be ordered to ascertain the facilities of conducting the Rail road to Harper's Ferry independently of the Canal; for although either of the alternatives here suggested would unavoidably involve a very large and unnecessary additional expenditure, beyond that of an amicable and conjoint location and construction,—the entire practicability of which has been so fully ascertained, and on all hands acknowledged; yet, as before remarked, the great objects to be attained will amply justify the excess of expense, that this company would be compelled to encounter, in conducting the Rail road to Harper's Ferry.

The Machinery and Moving Power.

This branch of the service has been conducted with the anticipated success, so far as it has been extended, and as relates to the construction of cars, considerably economised. For a detailed account of the operations in that department, I refer to the report of George Gillingham, Superintendent of machinery.

No very essential modifications of the two principal kinds of cars used, and which have been heretofore fully described, have been made since the last report; the experiment, however, then recommended, of employing springs in the burthen cars to obviate the effects of concussion, is now in the course of trial, and we have high expectations of its success and benefit in lessening the wear, both of the cars and the rails. With springs a greater load may be drawn, and at an increased velocity, without adding to the wear and tear. It is believed the same cars with springs, would be as competent to bear three tons, as two and a half tons without springs, and that the damage to the Railway would be less; indeed it is probable that a locomotive carriage of 4½ tons without springs, would be as injurious upon the Railway as one of 6 tons weight having springs, and that the difference will be at least 30 per cent. in favor of the latter.

The amount of benefit to result from the use of springs will, however, greatly depend upon the rate of speed employed; and whilst it is believed they will be beneficial at all rates of speed, their use will be indispensable at velocities, greater than 3 or 4 miles per hour. In case Locomotive Steam Engines, on account of their greater efficiency and economy shall supersede the use of horses upon the Railway, as is highly probable, a general accession to the speed will follow as a thing of course; for whilst the speed of horses in the conveyance of passengers cannot be made to exceed 10 miles per hour, that of locomotives need not be less than 12 to 15 miles, and under favorable circumstances of curvature and grade, may safely double these velocities; and again, whilst the maximum of useful effect, and which must be regarded in the transportation of commodities, is obtained at about 3 miles an hour, with horses, the maximum with the Locomotive engine does not obtain short of double that speed, and may safely be estimated at about 7½ miles per hour.

It would appear, therefore, that springs should be viewed as an indispensable appendage to all the cars, when steam shall be the power used in the transit.

It was mentioned in the last report, that a car with chilled boxes had been constructed so as to allow the axles to vibrate. A train of six cars of this description has been in the course of construction, and will in a short time be placed upon the Railway; the value of this arrangement will therefore soon be experimentally tested.

It has not yet been deemed expedient to erect the contemplated stationary engines, and fixtures at the inclined planes, at Parr's Ridge, though a portion of the machinery, consisting of wheels and sheeves for the applications of the ropes, and costing \$4,136.$\frac{09}{100}$ has been procured; hitherto the cars have passed upon the planes with horse power, but should the trade and intercourse continue to increase as expected, the stationary system will soon be found more economical than the method now in use, and can then be speedily established.

The appeal made within the last year by the President and Directors of the Baltimore and Ohio Rail Road Company, to the mechanical genius of this country, for the production of efficient Locomotive Steam Engines, of American manufacture, was mentioned in the last report, wherein it was stated, that of the several engines produced, only one, which had been constructed at York, Pennsylvania, by Phineas Davis, or rather by Davis and Gartner, had been found efficient, and that it was capable of conveying (inclusive of the weight of the cars) 15 tons 15 miles per hour on a level, but that in consequence of its lightness,—weighing only about 3½ tons, it could not be advantageously employed upon ascending lines of road.

This being the state of the Locomotive concern upon our road at the last report, it is proper now to notice the advances that have been made in these engines, since that time, in consequence of the call of the Board. Several very ingenious mechanics have employed themselves upon the construction of engines, of as many different forms, and whilst some have been entire failures, others have only partially succeeded in producing apparently efficient effects; some of the latter description, amongst the most prominent of which, Cooper's engine must be placed, it is believed, with such modifications as practice and the known mechanical skill of its projector will probably suggest, may succeed to the scale and rank of practical efficiency.

A new locomotive engine of enlarged dimensions and capability, has, however, been constructed and placed upon the Baltimore and Ohio Railway, by Davis and Gartner, who, profiting by their first successful attempt, have, in this instance, completely succeeded in combining in the new locomotive all the requisite efficiency, as regards capacity and motive power.

This engine, denominated the "Atlantic," has undergone the test of one month's continuous use in the transportation of all the passengers travelling between Baltimore and the inclined planes at Parr's ridge, a distance of 40 miles, making 80 miles each trip, going and returning daily. This engine has also performed many other trips through the same space, as well as lesser journeys with passengers and with commodities, in all of which the performance has been highly satisfactory.

The fuel used is exclusively anthracite coal, the combustion of which has been such as to give entire satisfaction and confidence in its use; yielding no smoke it is equally commodious with the coke of bituminous coal for this purpose, and is a cheaper fuel.

The total ascent of the Railway from a level of 66 feet above tide at Baltimore, to the foot of the first inclined plane is 567 feet, averaging about $14\frac{1}{4}$ feet per mile, and the steepest ascent, with the exception of a very short distance in reaching the level at the foot of the plane, the increased resistance from which will be overcome by the momentum, is at the rate of $37\frac{488}{1000}$ feet per mile, or at the rate of 1 in $140\frac{8}{10}$; and the next lower grade is at the rate of $34\frac{848}{1000}$ feet per mile, or 1 in $151\frac{5}{10}$; but whilst the curvature upon the former, which is of a radius less than 1000 feet, will not oppose a resistance to the motive power exceeding 1 lb. per ton of the weight of cars and lading, the curvature of the latter is, in some parts, of a radius of 400 feet, and which, according to recent experiments made to ascertain the fact, gives an average resistance amongst the cars of nearly 50 per cent. of the power required on a straight and level road, equal to 5 lb. per ton when the latter is 10 lb. Assuming the average resistance of the cars in use upon the road when the rails are far from being clean in consequence of dirt being thrown upon them by the horses feet, when those animals are used in the transportation, to be 10 lb. per ton on the parts of the way that are both level and straight, then the resistance from friction, gravity, and curvature on the part which has been described as ascending at $37\frac{488}{1000}$ feet per mile will be 10 lb. $15\frac{9}{10}$ lb., and about 1 lb. respectively, making a total resistance of $26\frac{9}{10}$ lb. per ton, and the resistances from similar obstacles on the part ascending at $34\frac{848}{1000}$ feet per mile, will be 10, $14\frac{8}{10}$ and 5 lb. respectively, amounting to a total resistance of $29\frac{8}{10}$ lb. per ton of the whole weight drawn. This last is equal to the resistance due to the ascent upon a straight road ascending at the rate of 1 in 113 or 46 $\frac{7}{10}$ feet per mile, and with a curvature of a radius not less than 1000 feet, to the resistance upon an ascent of 1 in 119 or at the rate of 44 $\frac{3}{10}$ feet per mile.

The resistance of 29 $\frac{8}{10}$ lb. per ton, which occurs upon the parts of the line ascending at 34 $\frac{848}{1000}$ feet per mile is, therefore, the greatest to be encountered, and consequently, will limit the load in ascending the line. We shall now see what this engine is capable of performing

The weight of the locomotive "Atlantic," with its charge of fuel in the furnace, and compliment of water in the boiler, is $6\frac{1}{2}$ tons; with about $\frac{3}{5}$ths of the weight or 4 tons resting upon the two travelling wheels, or road wheels, through the adhesion of which, upon the rails, the motion and power is communicated.—These wheels are 3 feet in diameter, and motion is communicated to them from the steam engine by means of a spur driver working in a pinion on the middle of their axle. Diameter of driver 28 and of pinion 14 inches, each full stroke of the piston, or descent and ascent, producing two revolutions of the road wheels, and equivalent, in motion, to single gearing with road wheels of 6 feet diameter. The two cylinders are upright, and are each 10 inches diameter, with a length of stroke equal to 20 inches; their connecting rods work the two cranks which stand at right angles to each other on the axis of the driver.—The boiler is tubular and stands in an upright position.

The effective power of these engines is limited by the amount of adhesion of the wheels, and by the quantity of steam generated and used in a given time. In England the adhesion of locomotive wheels is reckoned to be at least $\frac{1}{15}$ of the weight with which they bear upon the rails when the latter are in their worst state for adhesion, or covered with a film of mud or moist calcareous or marly earth, with which their lines of Railway are known to abound. Dry weather as well as heavy rains are favorable for adhesion, moist and drizzly weather unfavourable. In this country there is more dry weather, and more of heavy rains than in England, and the soil of the country through which this Railway extends is more sandy, and less liable to make the rails slippery. It is not doubted, therefore, that in the worst state of the rails, the available adhesion will be the $\frac{1}{12}$, and that this will only happen in the winter season, when the loads will be lighter, unless indeed, as will sometimes be the case, that trade will be diverted to the Railway in winter, in consequence of the frequent bad condition of other roads, and of the freezing up of the navigable avenues to market. At all times other than when the rails are in the condition here supposed the adhesion will be much greater, and probably not less than $\frac{1}{8}$

In the worst state of the rails therefore, the available adhesion is reckoned equal to the one-third part, and in their ordinary state, to the one half of the known friction or adhesion of iron upon iron.

The least adhesion will therefore be about 750lb. and the ordinary 1120lb; and the limit of the power of this engine, so far as the adhesions of the wheels is concerned, will be, for the two states of the rails, 75 tons and 112 tons, gross, or 50 and 75 tons of goods respectively upon a level straight road. For a level road curved with a radius of 400 feet, 50 tons, and 75 tons, gross, or 32 and 50 tons of freight respectively; likewise from Baltimore to the planes at Parr's Ridge, (after deducting 50lb. the resistance from curvature, and 148lb. the gravity, of the engine and tender, weighing together 10 tons,) the load will be 18½ tons, equal to 5 cars, carrying 12½ tons of freight in the one case, and in the other, and at ordinary times, 29¾ tons, or 8 cars with 20 tons of freight. The least load here mentioned, that is, 18½ tons, is equivalent to 6 cars and 100 passengers, whilst the greater would equal 10 cars, and 175 passengers to the inclined planes.

In the same state of the rails an advantage of at least 50 per cent in the quantity of tonnage conveyed, would be gained, on the level road, by the use of the Winan car: upon the ascents, however, the advantage would be much reduced, the gravity being of course, the same for each kind of car, and equal in the case before us, to the resistance both from curvature and friction.

With regard to power and supply of the steam, it may, in the first place, be observed, that it is the calculation to use steam of a density that will exert a pressure in the boiler of 50lb. per square inch; and supposing the pressure upon the pistons to be 40lb. per inch, their surface area being 157 inches, the entire pressure will be 6280lb. The English count upon 30 per cent. of the pressure as being effective in their locomotives; but if, in consideration of the gearing in this engine we only allow 25 per cent., it gives 1570lb. effective pressure; and if we suppose the friction of the locomotive to be 125lb., and augment this to 450lb. for increased friction when working with a full load, and for inertia, and add the amount to the value assigned to the adhesion in common states of the rails (1120lb.) the sum is 1570lb. the same as the effective pressure upon the pistons. It would appear, therefore, that steam at 40lb. pressure will always be equal to the adhesion of ⅛, and at times will be redundant.

The speed having to depend upon the quantity of steam which the cylinders can work off, and the furnace and boiler generate and supply, let us see the capacity of this locomotive in these respects.

For a speed of 15 miles per hour, the road wheels being 3 feet in diameter, must perform 140 revolutions in a minute, each revolution expending two cylinders full of steam. The area of the two cylinders is 157 inches, the length of stroke 20 inches, and hence the volume is 3140 cubic inches of steam, which taken 140 times, gives 439,600 cubic inches of steam consumed per minute, in a velocity of 15 miles per hour, upon the Railway. We have assumed the pressure to be 40lb. to the square inch, but if to allow for waste, we calculate for a pressure of 50lb. we find that to obtain 439,600 cubic inches of steam of that density per minute, 4 gallons of water must be evaporated per minute, or 240 gallons per hour. The steam-generating ability of this engine is competent to more than this, and it is believed to be capable of evaporating 300 gallons per hour; wherefore, since the power of the locomotive is proportional to the supply of steam, it will be capable of a speed of 17½ miles per hour with a full load, when 300 gallons of water per hour shall be converted into steam, and used at a pressure of 40lb. to the inch. With a less load the velocity could be greater than 17½ miles per hour.

There can be no doubt, therefore, that this engine would, in two hours running, convey a train of cars containing 200 passengers, the entire distance between the cities of Baltimore and Washington upon a Railway, such as is now in contemplation to connect those cities.

It may be observed that the capability of this engine to generate steam is fully equal to that of the best English engine. Before the late improvements there, the quantity of water evaporated per hour was only 94 gallons. The quantity evaporatec by several of the improved engines, is as follows:—Rocket 185 Phoenix 215, Arrow 275 gallons, and the Planet rather more The weight of the Planet and the Atlantic, as well as thei evaporating powers, are about equal; and there are good ground for believing that the performance of the "Atlantic" will b quite equal to that of any English locomotive of the sam weight.

It has been shown, that the capacity and proportions of th "Atlantic" locomotive, are suited to a speed of from 15 to 2 miles per hour, at full pressure: it follows therefore, that if r stricted to a speed of 12 miles between Baltimore and tl planes, this engine cannot work off all the steam that it can g nerate—whilst it is capable of generating at least 500,000 c bic inches of steam per minute, of a density due to a pressu of 50lb. per square inch, the cylinders could only use, at a v locity of 12 miles per hour, upon the Railway, about 350,000 cubic inches per minute. To increase the diameter of the cylinders, in order to absorb the larger quantity of steam would seem to be useless, since the pressure is already a match for the adhesion of the wheels. To increase the adhesion by adding to the weight of the engine would injure, if not destroy the Railway. The method to be pursued, when the velocity is less than 15 miles per hour, will, therefore be, to economise the fuel by consuming no more than is barely sufficient to generate the requisite supply of steam for the speed so diminished. We may here observe, that although the foregoing calculations have been made for an equal density of steam in the cylinders throughout the stroke, yet the arrangement of the machinery, is such as to work expansively through one-third of the stroke.

The daily cost of running the engine to the planes will, at the present high price of fuel, probably be $16, made up as follows:

Engineer	$2 00
Assistant	1 50
One ton Anthracite Coal	8 00
Oil	50
Repairs and Renewals	2 50
Interest	75
Contingencies	75
Total	$16 00

This expenditure in the motive power will perform all the service in the transportation of passengers now accomplished with 42 horses and 12 men, at a daily charge of $33, and therefore, at a saving of $17 per day, or of $6,205 per annum.

It is probable that the daily expense of the locomotive system in the conveyance of commodities in this region of the country, where fuel will continue to be comparatively dear, will not exceed $15 per engine in use. With the power of the "Atlantic," and travelling 80 miles per day, with full loads in the ordinary state of the rails, the performances would be, on a level straight road, 6,000 tons, conveyed one mile, for 1500 cents, or at the rate of $\frac{1}{4}$ of a cent, per ton per mile; on a level road with curves of 400 feet radius, 4,000 tons at $\frac{3}{8}$ of a cent, per ton per mile; on the road from Baltimore to Parr's Ridge, 1600 tons at $\frac{15}{16}$ of a cent, per ton per mile.—During a portion of the winter season the performances will probably be lessened about one-third part.

The foregoing statements indicate the very great advantage that would be gained in the cost of the transportation of commodities, if the Railway were extended from the Point of Rocks, up the nearly level and gently curved valley of the Potomac to Cumberland, or for an equal distance on the Shenandoah. It would appear, that on the $132\frac{1}{2}$ miles westward of the Point of Rocks, the grades and curves will be so very moderate, as to allow the transportation, by locomotives, to be done at a rate not exceeding $\frac{1}{2}$ of a cent per ton per mile. Whilst on the part between Baltimore and the Point of Rocks $67\frac{1}{2}$ miles, it will be about 1 cent and probably $1\frac{2}{10}$ cents per ton per mile, when the expense of passing the planes is added. The cost of motive power, in conveying a ton of goods, therefore, from Baltimore to the Point of Rocks, will be 81 cents, and thence for about twice the distance westward, only 66 cents, making together 147 cents for one ton, conveyed 200 miles, or $\frac{3}{4}$ths. of a cent per ton per mile. It must be recollected that these rates will be increased by the cost of the cars used in the transportation, and an allowance for contingencies, to cover the entire cost of transportation, augmenting it probably to one cent per ton per mile, yet this will not affect the striking character of the foregoing results.

An opinion was expressed in the last Annual Report, rather adverse to the employment, on the Baltimore and Ohio Rail road, of locomotives, exceeding $4\frac{1}{2}$ tons weight, from an apprehension of injury to the Railway; but when it is considered that the resistance reaches to about 30lb. per ton, upon parts of the present Railway, as we have it already calculated, and that a locomotive of $6\frac{1}{2}$ tons will only convey, to the foot of the planes, a train of 8 cars, containing 20 tons of freight, in a favorable state of the rails, and at other times only 5 cars, and $12\frac{1}{2}$ tons of freight, whilst the effect of the lighter engine would be further reduced to 5 cars, and $12\frac{1}{2}$ tons freight in the one case, and to 3 cars and $7\frac{1}{2}$ tons in the other, the advantage would appear to be greatly in favor of the use of the heavier engine, as to the quantity conveyed; and since the expense of attendance would be equal, the freight will be carried at a less cost by the same engine. The lighter engine and tender weighing 8 tons, would have to travel the road five times to three times of the other engine and tender of 10 tons, to produce an equal effect in the transit; one-third more tonnage of engine and tender must therefore actually travel the road, if the lighter engines were used. This circumstance added to the diminished cost of conveyance and less interruption, consequent upon the fewer engines in use to do the same amount of work, may be sufficient to counterbalance the evil effects that were apprehended, thoug not proved to exist, and will certainly justify the experiment Good springs should continue to be employed upon the engin and its tender as at present, and they should likewise be added to the burthen cars as soon as practicable. In that case the wear and tear will be greatly reduced, as has before been remarked.

The advantages of the locomotive system will consist in the reduced cost of conveyance, to arise from the cost of running these engines being less than that of the horse establishment, the saving of the expense attendant on the repairs of the horse paths, the increase of effect to arise from the more clean state of the rails, since the action of the horses feet casts much dirt upon the rails, by which the resistance is increased perhaps 25 per cent. and from the less number of cars required to perform an equal amount of transportation at double the speed. The gain from the use of locomotives will, however, be much greater in the conveyance of passengers, than in the transit of commodities, on account of the very greatly diminished useful effect of horses, when their speed approaches to 10 miles per hour, compared to that when the speed is only 2½ or 3 miles; yet if there should be but little gain in the latter case it will be advantageous to extend the locomotive rather than employ the mixed system.

A detailed account in relation to the transportation, will be made by Wm. Woodville, superintendent.

In my plans and operations, with respect to the machinery, and in addition to the aid of the superintendent of machinery, I have been assisted by Ross Winans and John Elgar, the latter of whom has not been in the service of this company since the first of July last.

Location of the Rail Road to Washington.

The examinations and surveys of the country between Baltimore and Washington, with a view to the location of a route for the contemplated Rail road to connect those cities, were begun, and partly accomplished, during the year 1831, as stated in the last Annual Report, and an estimate was made from the imperfect data, obtained in the course of the surveys of that year, and reported on the 17th of February last, of the probable cost of construction. That estimate was made upon the route that passes more nearly in the vicinity of the Turnpike road, and, including masonry, bridging with stone arches, graduation, a double track of Railway, superintendence and contingencies, amounted to $\$1,555.529,_{\frac{47}{100}}$. The route commenced on the Baltimore and Ohio Rail Road, six miles from Baltimore, and terminated at the north eastern boundary line, of the plat of the city of Washington, and included a distance of 29 miles. For a more particular account of the estimate here alluded to, and of the facts and principles upon which it was predicated, I refer to the accompanying document, marked H 1.

At the opening of the present season the Board resolved, that these surveys should be prosecuted to completion, and that a single party only should be organized for this purpose. Accordingly a party was formed, and placed under the immediate direction of Benj. H. Latrobe, assisted by Henry H. Krebs, Oliver C. Morris, John W. Smith, George T. Dunbar, Wm. K. Coulter, John Small and Henry R. Hazlehurst, in the respective capacities of draftsmen, surveyors, levellers, calculators, &c. For my instructions to B. H. Latrobe on this occasion, [See Document marked H 2.] herewith presented. The field operations relating to these surveys will be completed by the middle of the present month; and as soon as practicable thereafter, the office work will be accomplished; at which time I shall be able to report a very full, clear, and it is hoped, satisfactory estimate of the probable cost of construction, and efficiency of motive power on the several routes which are the most feasible, with the necessary notes, maps, and profiles.

In concluding this annual statement, it is but just to the several engineers, officers, and assistants, to say, that their services during the year just ended have been rendered with ability and fidelity. Several of them, namely, John Elgar, Henry J. Ranney, Ralph S. Smith, St. Albert M. Lea, Charles G. Hanson, Benj. A. Alderson, and Oliver C. Morris, have left the service of this company since the date of the last Annual Report, either through choice on their parts, or because of the limited operations of this company. Their services, however, were individually valuable, and were not parted with without regret.

All of which is respectfully submitted,

J. KNIGHT,

Chief Engineer.

(H. 1.)

REPORT. WASHINGTON RAILWAY.

Engineers Office, Baltimore and Ohio Rail Road,
Baltimore, February 17th, 1832.

To Philip E. Thomas, President, &c.

The calculations and estimates of the probable amount of expense that will be required in the construction of the contemplated rail road, to connect the cities of Washington and Baltimore, having just been finished, I take the earliest occasion, in accordance with thy request, to communicate the general results.

In the first place, however, it may be proper to give a concise general description of the proposed plan and profile of the contemplated rail way, and to advert to the character of the country, over which the route must be conducted.

The purpose of this rail way being to effect an easy and rapid communication between the National Capital and the third city in the Union, as well as to form an important and permanent part of the great inland highway, that must, in connection with the seat of the general government, exist, and always be used, in a direction parallel to the coast, through Richmond, Charleston, and Savannah, to the south, and Baltimore, Philadelphia, New York, and Boston, to the north; it would appear to be a concern involving great general interests, and the benefits of which would descend to remote generations.

The rail road under consideration, therefore, will have a national character, and should be planned and constructed in a manner worthy of its highly important position and functions.

To do less than this, would be to mar a great national work, to the loss of the investment, and to the lasting detriment of our character for science and enterprise. The capabilities of the road should therefore be such that no other work of any conceivable description could be brought into successful competition with it.

In this is involved considerations of speed and motive power, both scientific and practical, and these again must regard the resistances to be overcome, whether arising from friction, gravity, or the passing of curves. Friction upon rail ways, has, within a few years past, undergone great and important reductions; and it may be that the final term to which its ratio has been approximating, is not yet attained. From a careful consideration of this important item of resistance, and assuming the average of that of the two best kinds of cars now in use, and making allowance for practical imperfections in the rail way, and supposing also, the wheels to be three feet in diameter, I have no doubt that the attainable rate of the friction will be such as to reduce the traction on a level, to less than the 300th part of the weight moved; but as wheels of less diameter may be employed for common cars, I shall assume the practical traction at an average equal to the 264th. This resistance, therefore, will be equal to the gravity down a line of rail way, descending at the rate of one in 264, or 20 feet per mile, consequently the inclinations of a rail way from a level should not exceed this rate.

All motive agents, mechanical as well as animal, are capable of exerting, for a short time and occasionally twice the power that their regular and constant average work or movements require when the effect produced is a maximum. This has been demonstrated by the mathematician, and has likewise been found to accord with experience. Hence, the ascending lines of a road of any description should not have a grade requiring more than double the power necessary on the level parts of the same road. The power required on the ascent of the rail way, at the rate of 20 feet per mile, will be double of that required on *a level*, in addition to that which will be necessary to counteract the gravity of the motive agent. If, therefore, whilst the friction is the 264th, the ascents and descents are greater than one in 264, there will either be a loss of time, or else an unnecessary surplus of power would exist on the level parts of the rail way. In either case there will be a loss of effect when compared with the cost of transmit.

Moreover, since with the use of locomotive steam power upon this rail way, the velocity on the level parts should be as great as will comport with due safety; it follows, that the velocities upon the descending, should not be greater than upon the level parts; and therefore, any acceleration from gravity would not be useful, and could not be employed to any valuable extent in this particular instance. Consequently, in descending, as well as in ascending an inclination exceeding 20 feet in the mile would be disadvantageous.

Although the grade had been restricted as already mentioned, to one in 264 as the maximum; it was still desirable, that it should be less than this limit, and that as much of the road should be level as the surface of the country to be traversed would admit of consistently with a due regard to the expense of construction.

It was evident, that the velocities to be employed upon this road would be as high as confidence and safety would permit, and that a speed of about twenty miles per hour must be attained, so as to perform the trip from city to city within *two hours.* This will probably require the use of a locomotive engine, weighing six tons, to convey a train of six cars, containing one hundred passengers in the time proposed; for although the adhesion of the wheels of a 4½ ton engine would be sufficient for the draught of this train upon an ascent of twenty feet per mile, yet it is doubted whether its capacity for the generation of steam would be adequate to the whole performance within the specified time.

Taking it then for granted, that a six ton engine will be employed, and that the speed will be made to average twenty miles per hour, it becomes necessary that the road should be comparatively straight, in order that the centrifugal force, in curves may be small, and the stability of the engine and its train upon the rails insured; and likewise, that the unnecessary *wear* and *tear* should be prevented, and at the same time the power economised.

It was consequently concluded to make the curvatures so slight as to admit of the use of locomotive engine wheels, of a diameter of four or five feet, and so that just such engines in all respects as are now used on the Liverpool and Manchester rail way, could be run upon this road.

The minimum radius of curvature was assumed at 1400 feet. It is now known, however, that the line may be so laid, that the radius of curvature shall in no place be less than 2000, and in very few places less than 3000 feet, whilst the ascents and descents shall not in any part, exceed twenty feet per mile.

The greater part of the experimental lines already run, with a view to this rail way, have been traced, with a view to the limits of grade and curvature already mentioned, and the estimates are made for a line of this character.

A line more nearly approaching to that of a perfectly straight and horizontal line would have been preferred, but the character of the country does not admit of it within any practicable limits of expense in the construction, nor would the gain in the motive power be a sufficient return for the capital which must be added to make any material reduction in the altitudes of the summits to be passed, beyond such as are contemplated in the estimates.

The ridges crossed between the Baltimore and Ohio rail road, and Bladensburg, are three in number, the first divides the slopes of the Patapsco and Patuxent rivers; the second the two branches of the Patuxent; and the third the Patuxent and the North Eastern Branch of Potomac.

The altitudes of these ridges at the comparatively low points at which they are crossed, vary from 200 to 215 feet above the level of mid-tide, at Baltimore, and cuts from 40 to 50 feet in depth will be required, at the same time that the Patapsco and each of the Patuxents must be crossed at altitudes above them of from 40 to 50 feet respectively. It will, however, depend upon the result of surveys yet to be made, whether the route may be laid across the second and third ridges just mentioned, at points less elevated; but it is not expected, that this would materially reduce the amount of the estimate, as the route would be lengthened by the change; yet the question will involve considerations connected with the moving power to an extent that should not be disregarded in a route of such magnitude. The Patapsco may be crossed either at an altitude of 50 feet or of 66 feet above tide, according as the one or the other of the two places proposed, shall be ultimately selected for this purpose

From the Patapsco to the first ridge in a distance of about six miles, the route passes up the valley of Deep Run. In consequence of the uniformity of the extreme grade, necessary to be adopted, in order to gain the summit at an altitude of 165 feet above tide, the line is here thrown upon very rough, uneven ground, encountering a succession of spurs from the ridges and deep identations at the lateral small streams which have to be crossed; thus making the graduation of this part of the line very expensive. Thence to the head drains of the North Eastern Branch, a distance of about ten miles, the route continues to be equally expensive in consequence of the cuts through the three ridges before mentioned, and the embankments across the valleys of the two Patuxents. The tributary of the North Eastern Branch, having been gained, the route for about eight miles in its descent down the valley of that stream, to Bladensburg, is remarkably favourable. At Bladensburg, the valley of the North Western Branch, must be crossed with a long embankment, from 30 to 35 feet in height, and hence to the line of the plat of the city of Washington, a distance of about four miles the route is rough, and will require much heavy excavation.

From the line of the city of Washington, the Railway can b conducted to the General Post Office, in the further distance o about two miles, upon such route, and to such other points a shall be agreed upon. The uncertainty, however, of the futur position of this part of the line renders it impossible at thi time to extend the estimates to any point within the city bour dary.

The materials to be excavated will consist of sand, grav and clay; the latter will probably, in places, be found to be c a hard texture, and such as has been encountered on the fir seven miles of the Baltimore and Ohio Rail Road. This will probably be the case along Deep Run, and also between Bladensburg and Washington. With these exceptions a greater portion of sand and gravel may be found to obtain. Very little rock will be found in the whole extent of the route.

The estimate for the graduation has been carefully made up from the details of the several excavations and embankments, with a view as well to the supposed degree of tenacity of the material to be excavated, as to the distance it must be transported in executing the work, and the width of the road-bed to accommodate a double Railway, that is, two tracks, and the ditches necessary for drainage.

The masonry has been estimated on the plan of stone culverts and substantial stone arched bridges, without ornament or any unnecessary dressing. The stone will be found on the Patapsco, the two Patuxents, the North Western Branch, and on the Potomac, generally within a distance, probably, of 5 or 6 miles of the site of the works to be constructed. In estimating the masonry, due regard has been paid to the probable expense of securing the foundations, the quality of the work, the quantity of the materials, the distance of transportation and the proportions of the parts.

In estimating the cost of the Railway, regard has been had to the action it will have to sustain, the quantity and quality of the materials to be used in the construction, to the necessary labor to be expended, and to contingencies and superintendence.

It is confidently believed that the great *ends* to be expected from the establishment and use of this important avenue of communication will be attained, should the plan and profile, as already described, be adopted, and a Railway suited to the action of locomotive engines weighing six tons, be constructed.

With a view to the action of such engines in high velocities. it is proposed to lay down rails of a description different from those on the Baltimore and Ohio Rail Road. The absence of stone suitable for sills throughout this entire line, renders it impracticable in the first instance, to use that material, in the construction; and it may be likewise remarked, that even were this material sufficiently abundant; it would be some years before the embankments would be sufficiently settled to receive a structure of this kind.

These circumstances compel the use of wood instead of stone to support the iron rails, and it is proposed to place the sleepers or tie pieces, three feet apart instead of four feet as heretofore, and to use string pieces of wood underneath the sleepers in addition to those laid upon them, in order to strengthen the track, and to prevent unequal and partial settling. These under timbers may be various in their dimensions; and such as are to be procured with most convenience. The upper string pieces, however, which rest upon the sleepers, and on which the iron rails will be placed, are proposed to be six inches square, of southern pine scantling, and of the best quality that can be obtained. The iron rails will have a continuous flat base, in width 3½ inches, resting upon the wood; each rail will be about 15 feet in length and about two inches in height, so as to permit the flanges of the wheels to play above the base plate. These rails will be rolled of such form as to economise the quantity of iron to the greatest extent, consistent with utility. The rail will weigh about 32 pound per running yard, and it will require 50 tons for each mile of single track.

With regard to the policy of estimating for two sets of tracks instead of one only, it may be proper to observe, that although there is little doubt that the capacity of a single track, with the proposed velocities, would be sufficient to effect the whole of the transit that would be required upon the proposed Railway for some years to come; yet when it is considered that repairs will be needed, and that for these purposes, materials must be conveyed for long distances on the line, and that considerable quantities of earth must occasionally be removed from the ditches in the long and deep cuttings, and transported in Railway cars to supply defects in embankments, or to some other place of deposit; and when it is also considered, that two tracks would allow the business of the road to be performed in the day time whilst the number of trains, and their hours of departure and arrival, could be increased as circumstances should require; the belief is entertained, that it will be advantageous to have two sets of tracks.

The difficulties to be overcome having been adverted to, and the plan of the work described, it will be proper next in order, to give the results of the estimates.

The mason work will consist of 6,357 perches of culvert masonry, estimated to cost $24,010, being an average of $3,77¾ per perch of 25 cubic feet, together with 32,380 perches of bridge masonry, in which arches are to be made. The cost of this item is estimated at $215,135, or at the rate of $6,64½ per perch: amounting together to 37,738 perches of masonry, and costing $239,145, being an average of $6,17⅓ per perch. This charge is considerably enhanced in consequence of the estimated expense of securing the foundations for the works.

The total mass of earth and other material to be excavated, removed and supplied, to effect the entire graduation, is calculated to be two millions four hundred and six thousand seven hundred and sixty-one cubic yards, estimated to cost the sum of $779,518.15, being an average of 32.39 cents per cubic yard.

The length of the route included in the estimate is 29 miles.

Summary.

Graduation, 2,406,761 cubic yards, at 32.39 cents	$779,518.15
Maronry, 38,737 perches at $6.17½	239,145.00
Amounting to	1,018,663.15
Add 10 per cent for contingencies and superintendence	101,866.32
	1,120,529.47
Railway double track 29 miles at $15,000 per mile	435,000.00
Total amount	$1,555,529.47

The details of the estimate from which the foregoing results have been obtained are in this office, and statements of them will be reported if necessary. Maps and profiles are likewise nearly completed, representing the several routes surveyed.

The final location of the route of the railway can be commenced as soon as the weather will permit.

In making the estimates, I have been assisted, with regard to the masonry, by Robert Wilson, assistant superintendent of masonry; and so far as relates to the structure of a track of railway, by James P. Stabler, superintendent of construction of the Baltimore and Ohio Rail Road.

In the surveys, drawings and calculations, I have been aided by Henry J. Ranney, Benj. H. Latrobe, and the other young gentlemen named in my last annual report.

All which is respectfully submitted,

Signed, J. KNIGHT,
Chief Engineer.

[H 2.]

ENGINEERS OFFICE, BALT. AND OHIO RAIL ROAD,
BALTIMORE, *April* 9*th*, 1832.

To B. H. Latrobe, Assistant Engineer.

In accordance with verbal instructions received from Philip E. Thomas, President, I have already informed thee that the Board of Directors had resolved at their last meeting to continue the surveys on the route of the proposed Railway to Washington, and that only one surveying party shall be employed in this service.

Thee, will therefore proceed without loss of time to organise a single efficient party, and to carry on the necessary surveys, levels, measurements, calculations and drawings, in order to effect the final location of the route of the contemplated Railway, from some point on the Baltimore and Ohio Rail Road, not less than 6 miles from the depot, on Pratt street, to some point at or within the boundary line of the city of Washington, hereafter to be designated.

Although many of the requisite experimental surveys have already been made with a view, to the location of the route of this Railway, still, several highly important surveys have yet to be executed, and calculations made before it can be possible to designate the proper general route of this Railway without danger of material error.

These experimental surveys will be so ordered and made as to develope the best practicable route from Merrill's Ridge, passing the little Patuxent, near Duvall's old mill, and the ridge between the two Patuxents at the low depression, near the school-house, thence in the best manner to some convenient intersection, with the route already run near Zadoc Duvalls, and at or near to the head drain of the Eastern branch. This done, the most direct and practicable route will next be traced from the depression near the said school-house, to some point in the route heretofore run, near Bladensburg. The great object of the latter will be to save distance and expense of construction, if practicable, as well as to obtain a more level route, than the one which passes near the Turnpike road, and by Vansville, and upon which the estimates already reported were predicated.

A third experimental route will then be run, the peculiar characteristic of which will be directness of course and consequent shortness of distance: this will be an intermediate route, crossing the ridge somewhere between the crossing of Snowden's Ridge, at the 21 mile stone, and Zadoc Duvalls; it will leave the route estimated as aforesaid, at some point between Merrill's Ridge and the little Patuxent, perhaps at the great bend in that route, near N. Dorseys, and it will intersect the same route below Vansville, on the Piney branch, or will fall into the route on the Eastern branch, according to circumstances which the surveys shall determine.

For further instructions, I refer to all of those heretofore given, so far as they may be applicable, and will from time to time give others, either verbally or in writing.

Respectfully,

J. KNIGHT,
Chief Engineer.

THIRD ANNUAL REPORT

OF THE

Superintendent of Graduation and Masonry.

[I.]

Office of the Supdt. of the Graduation and
Masonry of the B. & O. Rail Road.
FREDERICK, Oct. 1st, 1832.

To PHILIP E. THOMAS, ESQ., *Prest.*
Balt. & Ohio Rail Road Co.

SIR:—I have the gratification to state that, since the date of my last annual report, the graduation and masonry, confided to my superintendency, has been entirely finished as far as I have been authorised to place it under contract; and I now present a statement of its actual cost upon the first grand division of this great work, extending from the City of Baltimore to the Point of Rocks, on the right bank of the river Potomac, a distance of 67⅝ miles, and also of that on the Lateral Branch to the City of Frederick, which deflects from the main line of the road at a point distant from Baltimore 56⅝ miles and is, itself, in length, a little over 3⅜ miles. For the purpose of exhibiting this somewhat in detail, and yet in a condensed form, the accompanying table marked I. No. 1, has been prepared. In previous reports, the names of contractors and the prices of the different kinds of work undertaken by them, respectively, were brought to view and are therefore now omitted.—This table exhibits the length of the sections of the several divisions, and their cost for graduation and masonry, separately, and aggregately, also the entire cost of each of these parts of road-bed formation from the beginning of the line to the end of every section, both singly and jointly.—To this table there is appended a Recapitulation by Divisions.

Graduation.

The graduation of the whole line, the Lateral Branch to Frederick inclusive, was contracted and paid for by the cubic yard of excavation or embankment, as the one or the other was the greater in quantity, excepting that part of the first division from the 13th to the 25th section, both inclusive, and the whole of the second division. These parts were contracted for by the pole running measure, but their contents in cubic yards have been correctly estimated. By the table submitted, it is shown that, the whole distance graduated, exclusive of the Road between the Depot on Pratt street, and the City Block, is 71 miles $9\frac{16}{100}$ poles; and that the whole cost has been $804,142.90, or at the rate of $11,321.38 per mile; that the number of cubic yards actually handled has been 2,510,713, and cost at the average rate of $32\frac{03}{100}$ cents a yard. This sum includes not only the cost of the excavation and transportation of the earth and rock of every description, but also all the grubbing, clearing, and side drains. When this fact is considered and when it is also recollected that, a considerable portion of the work was done by night; that almost the whole of it was pressed forward with a rapidity seldom equalled, but very prejudicial to economy,—that about half of the line passed through wood land,—and that a third part, perhaps, of the excavation, was of rock, and much of that of the hardest kind,—that a large portion of the earth was transported long distances, in many instances half, and in some cases three quarters of a mile, it cannot but be conceded by those at all conversant with such operations, that the work has been cheaply executed. It might be added that, almost all of the embankments were formed of successive thin strata of earth, a measure which, whilst it gave firmness and stability to the work, was nevertheless calculated to enhance its cost.

An inspection of this table will show that the first $15\frac{1}{2}$ miles which end at a point a short distance east of the dam across the Patapsco river, belonging to the Union Manufacturing Company, cost for graduation, as much as the remaining $55\frac{1}{2}$ miles; and that the cost of those $15\frac{1}{2}$ miles has been at the rate of $25,837, or very nearly twenty-six thousand dollars a mile; and that of the next $55\frac{1}{2}$ miles has been only $7,233, or but a little over seven thousand dollars a mile.

That the graduation of the first six miles, terminating at the 2d crossing of the Washington turnpike road, cost at the rate of $48,580 a mile, whilst that on the remaining sixty-five miles cost at the rate of only $7,885 a mile;—or the former distance cost per mile upwards of six times as much as the latter—

That the graduation between Baltimore and Ellicott's mills, a distance of 13 miles, has cost at the rate of $29,193.92 a mile, and that the remaining 58 miles, including the Lateral road to Frederick, cost at the rate of only $7,290.56.

Masonry.

Table I. No. 1, shows that on the whole line of the road, the Lateral Branch to Frederick inclusive, there have been constructed 79,882¾ perches of masonry of 25 cubic feet to the perch; and that this masonry, including the cost of three superstructures of wood, cost the gross sum of $318,367.77, or at the rate of $3.98½ per perch. The distance upon which it was built being 71 miles, 9$\frac{16}{100}$ poles, it results that its average cost per mile was $4,482.24—and that the average number of perches per mile was 1,124$\frac{64}{100}$. Many of the bridges were loaded with an immense weight of earth as soon as they were built. Upon some of them there have been formed embankments of from 15 to 37 feet in height. It was essentially necessary then, that such should be constructed of masonry of the very strongest and most substantial character. When this fact is known, and it is also considered that nearly all of the masonry was put up with great rapidity, and consequently at increased cost,—that some of it is of dressed work,—that the arches of the bridges are formed in almost every instance of stone cut so as to conform to the radii of the circle of which the arch is a segment,—that the stone in some cases, and in large quantities, were transported from four to nine miles,—that the timber in the large structure over the Monocacy, was procured on the Susquehanna river, and land borne forty-eight miles,—and that the foundations of several of the bridges were very difficult and expensive of excavation, the cost of $3.98½ a perch, inclusive of the wooden superstructures, will be regarded as very moderate, and may be compared advantageously, perhaps, with that of the masonry on any other public work in this country.

An examination of the table I, (No. 1,) will show that the masonry on the first 8¾ miles of the line, cost nearly $7,000 more than that on the remaining 62¼ miles;—

That those 8¾ miles cost for masonry, at the average rate of $18,563.38 a mile, whilst the remaining 62¼ miles, cost only at the rate of $2,505.03 a mile.

That on those 8¾ miles, there were built 29,955¼ perches, which cost per perch $5,42.$\frac{3}{10}$, and that on the remaining 62¼ miles, there were constructed 49,927½ perches, which cost at the average rate of only $3,12$\frac{3}{10}$ a perch.

That the masonry on the first six miles, cost at the rate of $24,217 a mile, and at the rate of $5.61 a perch, whilst that on the next 65 miles cost at the rate of only $2,666 a mile, and $3,20 a perch, although in the latter is included the cost of three superstructures of wood; thus showing that the cost of the former per mile has been upwards of nine times that of the latter.

That the masonry on that part of the road between Baltimore and Ellicotts' mills, 13 miles, cost at the rate of $17,160.64 a mile, and per perch $\$4,74\frac{2}{10}$, whilst that on the remaining 58 miles, including the lateral branch to Frederick, cost at the rate of only $1,622.72 a mile, or per perch $\$2,88\frac{6}{10}$.

On the whole line of road, there have been erected the following described bridges and viaducts, which are numbered from east to west, viz.

1. A bridge of rough masonry over Gwynn's run, of one arch of 20 feet chord, which supports a heavy embankment.

2. The Carrollton bridge of dressed masonry, over Gwynn's Falls, of two arches, one of 80 feet 3 inches, the other of 20 feet.

3. A bridge of rough masonry over Roberts' run, of one arch of 20 feet chord, which supports an embankment of upwards of thirty feet in height.

4. A viaduct of rough masonry over Mr. Warfield's road, of one arch of 14 feet chord.

5. A bridge of rough masonry, of one arch of 25 feet chord over Gadsby's run, which supports an embankment 37 feet high.

6. A bridge of rough masonry, of 10 feet span, over Smith's branch.

7. A bridge or viaduct over Dorsey's run, of dressed masonry, of one arch of 15 feet chord, intended to pass a farm road under it.

8. A bridge or viaduct of partly rough and partly dressed masonry, of one arch of 12 feet chord, over Ellicott's branch, intended also for the passage under it of a farm road.

9. A bridge or viaduct of partly rough and partly dressed masonry, over Dismal run, of one arch of 12 feet chord, likewise intended for the passage of a farm road under it.

10. A bridge or viaduct of 20 feet chord, of dressed masonry, over Caton's branch; also intended for the passage of a road under it.

11. The Patterson bridge of rustic masonry, over the Patapsco river, of two arches of 55 feet chord each, for the vent of the river, and two arches, one on each side of the stream, of 20 feet span each, to pass county roads through.

12. The Oliver viaduct over the Frederick turnpike, at Ellicotts' Mills, of rustic masonry, of two arches of 20 feet chord each, for the road, and one arch also of 20 feet, to vent Ellicotts' branch.

13. A bridge of roughly hammered work over a branch opposite the Union Factory, of one arch of 20 feet.

14. A viaduct of rough masonry over the road leading to Judge Dorsey's old mills, of one arch of 12 feet chord.

15. A bridge of rough masonry over Brown's run, of one arch of 12 feet chord.

16. A bridge of rough masonry over Davis' run, of one arch of 14 feet chord.

17. A bridge over Marriott's branch, of rough masonry, of one arch of 14 feet chord.

18. A bridge at Marriottsville, of rough masonry, over Howard's branch, of one arch of 12 feet chord.

19. A bridge of rough masonry, of 40 feet chord, over the west fork of the Patapsco.

20. A bridge of rough masonry over Piney run, of 20 feet chord.

21. A bridge over Gillie's falls, of rough masonry, of 25 feet chord.

22. A viaduct over the Frederick turnpike road, between inclined planes Nos. 1 & 2, of rough masonry, with one arch of 20 feet chord for the passage of said road—and one arch of 10 feet chord, to vent a small stream.

23. A bridge of rough masonry, in Roderick Dorsey's mill pond, of one arch of 12 feet, to vent the stream, a branch of Bush creek, which operates his mill.

24. A viaduct of wood, near the head of inclined plane No. 4, only rendered necessary by Roderick Dorsey's injunction—about 80 feet span.

25. A bridge of rough masonry over a small branch near the foot of inclined plane No. 4, of one arch of 10 feet chord.

26. A viaduct over M'Elfresh's road, of stone abutments of rough masonry, and superstructure of wood—12 feet span.

27. A bridge of rough masonry over Bush creek, of one arch of 25 feet chord.

28. A bridge of rough masonry over New Market branch, of one arch of 12 feet chord.

29. A bridge of rough masonry over Shipley's run, of one arch of 12 feet chord.

30. A bridge of rough masonry over Hall's run, of one arch of 10 feet chord.

31. A bridge over the Monocacy river, abutments and piers of rough masonry, and superstructure of wood, of three arches of 110 feet each—whole length of bridge; 350 feet. Road way over it is elevated, above low water 37 feet.

32. A viaduct for the passage of the Georgetown and Frederick turnpike road, over the rail road—the abutments of rough masonry, and the superstructure of wood, of one span of 20 feet.

33. A bridge of rough masonry over Ballinger's creek, of one arch of 30 feet chord.

34. A bridge of rough masonry over Tuscarora creek, on Carroll's manor, of one arch of 20 feet chord.

35. A bridge over the Flag-pond branch of the Tuscarora, of one arch of 10 feet chord.

Of these bridges and viaducts, from No. 1 to 12, both inclusive, are on the First Division—from 13 to 17 inclusive, are on the Second—from 18 to 22 inclusive, are on the Third—from 22 to 31 inclusive, are on the Fourth—from 32 to 35 inclusive, are on the Fifth Division.

Besides these bridges, there have been built a very large number of gothic and square culverts, and a few detached walls.

It is highly creditable to the contractors and officers of the Company, that I am warranted in stating, that not a single instance has occurred of one of those bridges or viaducts proving defective. It has, in a few cases, been deemed expedient as a measure of prevention against possible casualty, to construct additional buttresses; and more effectually to secure their foundations, to introduce inverted arches.

Graduation and Masonry.

Table I No. 1, shows the total cost of the graduation and masonry on the main line and Lateral Branch to Frederick, to have been $1,122,510.67—the total distance being 71 miles and $9\frac{16}{100}$ poles, it results that the cost per mile was $15,803.52. It is further shown by this table,

That the first 11 miles of this distance, commencing at Pratt street, Baltimore, and terminating at a point opposite the Thistle Cotton Factory, has cost $44,000 more than the next 60 miles;

That whilst the first 11 miles cost for graduation and masonry at the average rate of $53,000 a mile, the next 60 miles cost at the average rate of only $8,985;

That the graduation and masonry on the first six miles of the road, which extends from Pratt street to the 2d crossing of the Washington turnpike road, cost at the rate of $72,797 a mile whilst that on the next sixty-five miles cost at the rate of only $10,546 a mile, thus showing that the first six miles cost, pe mile, very nearly seven times as much as the next sixty-fiv miles;

That the cost of that part of the line between Baltimore an Ellicott's mills, 13 miles, cost for graduation and masonr $605,912.59, whilst that on the next 58 miles cost but $516, 598.08, thus showing that those 13 miles cost $89,314.51 mor than the last 58 miles, and

That the first 13 cost at the rate of $46,354.56 a mil whilst the last 58 cost at the average rate of only $8,913.3 per mile.

The causes of the immense difference in the cost of th work on different parts of the line have, in former reports the Board, been so fully stated, that there is no necessity of again referring to them. They arose from the highly unfavorable topography of the ground over which the road was located, and the unavoidable expense of procuring the materials for the construction of the large, and for that distance, numerous bridges that were required.

By comparing the whole cost as now presented, viz:—$1,122,510.67, with the estimate furnished with my last report, viz: $1,101,615.25¼, it will be seen that the actual, has exceeded the estimated cost the sum of $20,895.41¾. This excess of expense of graduation and masonry above the estimate, which was founded upon the contract prices, has been wholly occasioned, by the Board of Directors having instructed me to pay extra prices to several of the contractors, in consequence of the occurrence of unforeseen and unexpected difficulties, against which no foresight could have guarded.

The following abstract or tariff of rates of cost, furnishes a comparative view of the expense of graduation and masonry of each division, and of the Lateral road, and also of the whole of the first grand Division of the road, including the Lateral road, by the cubic yard of earth actually handled,—by the perch of masonry actually built,—as well as the cost per mile of graduation and masonry, separately and jointly, of each subdivision, and of the whole line. It is to be recollected that the quantum of earth handled on thirteen sections of the First Division, viz: from the 13th to the 25th, both inclusive, and on the whole of the second division, is taken from estimate, and the balance from measurement:—

Division.	*Graduation.*			*Masonry.*				*Graduation and Masonry.*	
	Average cost per cubic yard, in cents.	Average cost per mile.		Average cost per perch of 25 cubic feet.		Average cost per mile.		Average cost per mile.	
		Dollars.	Cts	Dolls.	Cts.	Dollars.	Cts	Dollars.	Cts.
City	$29\frac{9}{10}$	18,996	16	6	$19\frac{4}{10}$	17,124	16	36,120	32
First	$32\frac{04}{100}$	30,366	08	4	$61\frac{8}{10}$	17,165	12	47,531	20
Second	$29\frac{14}{100}$	7,653	44	2	$93\frac{6}{10}$	2,471	04	10,124	48
Third	$30\frac{4}{10}$	6,599	04	2	$40\frac{9}{10}$	1,093	12	7,692	16
Fourth	$35\frac{3}{10}$	7,536	—	3	$60\frac{9}{10}$	2,291	20	9,827	20
Fifth	$31\frac{3}{10}$	7,118	40	2	$36\frac{9}{10}$	1,092	80	8,211	20
Latl. Road	44	9,075	20	1	$58\frac{5}{10}$	,273	60	9,348	80
Whole Line	$32\frac{03}{100}$	11,321	28	3	$98\frac{5}{10}$	4,482	24	15,803	52

In the cost of the masonry of the 4th Division, is included the expense of a viaduct of wood on the 7th section over a farm road; and also that of the extensive and substantial superstructure over the Monocacy river, on the 26th section. If a proper deduction be made for the cost of those structures, the cost of the actual masonry will have been per perch $\$2.46\tfrac{9}{10}$, and per mile $1,567.70, instead of $\$3.60\tfrac{9}{10}$, and $2,291.20—as shown by the tariff of rates. In the cost of the masonry on the Fifth Division is included the cost of a wooden viaduct on the first section, to pass the Georgetown and Frederick turnpike road over the Rail road. If this be subtracted, then the cost per perch of this division will be $\$2.27\tfrac{1}{10}$, and per mile $1,047.41—; instead of $\$2,36\tfrac{9}{10}$, and $1,092.80, as exhibited in the statement.

Damages.

As a very considerable amount of the expenditure of the company, for the right of road-way, and for the indemnity of damages occasioned by the passage of the road, were disbursed by me, I have, according to your instruction obtained a list of the amount also disbursed, by other officers of the company fo this object, and have embodied the whole in tabular form for th convenience of reference, and herewith present it. [See tabl I No. 2.]

The aggregate amount expended for the right of way an other damages, caused by the construction of the Rail-road appears to be $36,984.24. There is also yet payable the sum $1363.25, if this be added to that already expended, it wi produce the sum of $38,347.49, but from this amount must deducted $528, paid by the citizens of Frederick, leaving th whole sum paid and payable by the company $37,819.49.

Expenditures.

The whole amount expended by me in the service of t company has been one million one hundred and ninety-thr thousand seven hundred and seventy-four dollars, and sevent nine and one fourth cents, all of which has been regularly a duly accounted for:

Of this sum there has been applied to the graduation, - - - - - -	$804,142
To the masonry, - - - - -	318,367
To the payment of the right of way for the road, materials for its construction, jurors, clerks and sheriff's fees, repairs of Turn-	

pike, state, county and farm roads, injured or changed by the construction of the Rail road, &c, &c. [See table I. No. 2.] -	25,744 07
To the payment of the contingent expenses of my department, including salaries, instruments, advertising, printing, &c. &c.	34,638 35½
* To the purchase of tools, lumber, &c.	10,881 69¾
	$1,193,774 79¼

By this statement it is shown that the contingent expenditures have amounted to a sum not quite equal to three per centum, on all my other disbursements.

In concluding this report I feel it due to very many of the contractors to state, that they were vigilant and enterprising, that they executed their contracts with fidelity and energy, and that, but few if any, received the reward to which they were entitled, by their toils, their exposures and their industry, and that I know, that some, and I fear others, have sustained losses on the work. The mechanics and labourers have suffered but little loss, less I feel persuaded, than falls to their lot on public works generally, and indeed, in my opinion, less proportionally than they ordinarily sustain in their engagements in the private pursuits of life. It has been shown, that upon the graduation and masonry of this work,$1,122,510.67 have been expended, and yet I have good reason to believe, that the aggregate loss to the laborers has not amounted to the sum of $6,000.

The regulation prohibiting the use of ardent spirits first adopted with your sanction in 1829, has been steadily and rigidly adhered to, and has had, I am confident, a very beneficial influence upon the work. The contractors so generally acquiesced in this regulation, and complied with this stipulation of their contract so faithfully, that I had, only in a single instance, to perform the unpleasant duty of dismissing one of them from the service for an infraction of it. I cannot, however, refrain from again calling your attention to the fact, that licenses are so cheaply and so easily obtained in this state, where the sale of them appears to be only for the purposes of revenue, that grog shops became very numerous in the immediate vicinity of the line, and were highly prejudicial to the laborers, to the contractors, and to the progress of the work, and my opinion remains unchanged, that a legislative enactment preventing the vending of ardent spirits within a specified distance of public works could not fail of producing good effects, or rather of preventing much evil.

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* The lumber, tools, &c. have been delivered to other officers of the company.

I feel it a duty again, to advert to the unfavorable effects which undue rapidity in the execution of the work, most certainly produces in its increased cost,—in the morality of those employed by hastily and indiscriminately assembling together the correct and vicious, the industrious and indolent, in fact, all description of persons. It is proper too, that I should remark that a steady and regular advancement of the work could not fail of cheapening it as well as rendering its superintendency less arduous to your officers.

It is but mere justice to acknowledge, that from my principal assistants, Messrs. Henry M. Pettit and Robert Wilson, the first in the superintendence of the graduation and the second in that of the masonry, I have derived very important aid. Mr. Pettit was employed on the work a short time after its commencement and continued on it to near its close, and rendered me highly valuable assistance. Mr. Wilson commenced his valuable services with the beginning of the masonry, and continued them until it was entirely finished. It is to his skill and vigilance that the masonry is mainly indebted for whatever of permanency it possesses, for with the exception of the designs of the larger structures, and a few of the smaller ones which were made by myself, he planned and superintended the execution of the whole of it. The services of my late assistants, John Miller, Caleb B. Moore, and Paul H. Borland, also require my acknowledgements. Of them I can say with pleasure, that they were persevering, industrious, and judicious in the execution of the duties assigned them respectively.

I cannot close this report without tendering to you, and through you, to the Board of Directors, an expression of my thanks for the unwavering confidence you and they have reposed in my integrity and judgment, and to say that this has been and ever will continue to be, more highly prized than any compensation of a pecuniary character which they could have made me.

Respectfully submitted,

CASPAR W. WEVER.

L No. 1.

AN EXHIBIT of the number and length of the Divisions and Sections of the Baltimore and Ohio Rail Road, from Baltimore to the "Point of Rocks," on the Potomac river—the total distance from Baltimore—the actual quantum, description and cost of Masonry and cost of the Graduation of those Divisions and Sections—and the total cost of the whole line, including the Lateral Road to the City of Frederick.—Accompanying the Third Annual Report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1832.

Designation of Division	Designation of Section	Length of section in poles	Total distance from Pratt street: Miles	Total distance from Pratt street: Poles	GRADUATION. Quantities. Cubic yards of Excavation	GRADUATION. Quantities. Cubic yards of Embankment	GRADUATION. Cost. Of each Section	GRADUATION. Cost. Of the whole line	MASONRY. No. of perches of twenty-five cubic feet, on each section	MASONRY. Cost on each Section	MASONRY. No. of perches of twenty-five cubic feet on the whole line	MASONRY. Cost on whole line	Aggregate cost of Graduation and Masonry. Of each Section	Aggregate cost of Graduation and Masonry. Of the whole line	Number of Section	REMARKS
City	East'n	140.		140.	21,742	21,742	8,591 31¼	[illegible]	62¼	3,5[illegible]	62¼	3,5[illegible]	12,16[illegible]	12,1[illegible]	E.	
	Mid'e	162.		302.	[illegible]	[illegible]	10,51[illegible]	19,[illegible] 12	18[illegible]	1,4[illegible] 15	815¼	4,9[illegible]	11,5[illegible] 22¼	23,7[illegible] 19	M.	Terminates opposite Mount Clare House.
	West'n	139.52	1	111.52	22,01[illegible]	22,01[illegible]	6,311 1[illegible]	25,6[illegible]	2,91[illegible]	18,6[illegible]	3,7[illegible]	23,[illegible]	24,94[illegible]	[illegible]	W.	Crosses Lemmon's Run and ends at the "First Stone" or City Boundary.
First	1	152.1[illegible]		[illegible]3.44	11,07[illegible]	19,6[illegible]	3,755 49	31,[illegible]	11,47[illegible]	55,45[illegible]	14,771	81,[illegible]	64,240 70	112,[illegible]	1	Crosses Gwynn's Falls over the Carrollton Bridge forty feet above the surface of the water of the falls.
	2	197.4[illegible]	2	[illegible]1.84	77,5[illegible]	11,[illegible]	30,526 [illegible]	61,[illegible]	16[illegible]	5[illegible]	14,[illegible]	82,1[illegible]	51,06[illegible] 54¼	143,[illegible] 21	2	This section crosses the Washington City turnpike under a wooden viaduct.
	3	125.[illegible]		[illegible]5.5[illegible]	17,8[illegible]	18,3[illegible]	5,393 [illegible]	65,27[illegible] 21	14[illegible]¼	44[illegible]	15,[illegible]81¼	82,53[illegible] 14	5,84[illegible]	14[illegible] 70¼	3	
	4 & 5	322.2[illegible]	3	267.[illegible]	310,25[illegible]	42,5[illegible]	122,116 52¼	187,[illegible]	17[illegible]¼	500 15¼	15,264	83,11[illegible]	122,67[illegible] 48	271,511 25	4 & 5	These sections pass through the "Deep Cut," and cross the Annapolis road. Depth of deep cut, seventy feet.
	6	122.50	4	70.3	1,7[illegible]	[illegible]	9[illegible]	188,[illegible]	....	....	15,264	83,11[illegible]	9[illegible]	271,447 2[illegible]	6	Runs parallel with the Annapolis road.
	7	103.44		1[illegible]	25,46[illegible]	76,34[illegible]	19,636 52	207,[illegible] 47	2,918¼	11,140 [illegible]	18,182¼	94,[illegible]	30,7[illegible] 89¼	302,2[illegible]	7	Crosses Robert's Run over an embankment fifty feet high.
	8	301.04	5	57.[illegible]	21,8[illegible]	26,[illegible]	3,78[illegible]	211,[illegible]	44[illegible]	[illegible]	18,62[illegible]	[illegible]	5,0[illegible] 19¼	307,31[illegible] 24¼	8	Passes Iron Mines.
	9	187.24		244.24	[illegible]	51,55[illegible]	14,147 52	225,[illegible]	[illegible]	4,[illegible]	[illegible]	100,[illegible]	18,611 35¼	325,[illegible]	9	Crosses Gadsby's road over a stone viaduct.
	10	[illegible]	6	[illegible]	115,67[illegible]	210,101	65,584 75¼	291,183 1[illegible]	6,510	45,2[illegible]	[illegible]	145,[illegible] 53	110,85[illegible] 31	456,[illegible] 71	10	Crosses Gadsby's Run over an embankment fifty-six feet high, and also crosses the Washington turnpike on the same level.
	11	108.		[illegible]	9,578	11,94[illegible]	1,950	293,433 16	45¼	[illegible] 11	[illegible]	145,[illegible]	1,99[illegible] 11	438,77[illegible]	11	Runs through D. A. Smith's land near Elkridge Landing.
	12	103.	7	[illegible]	8,96[illegible]	60,93[illegible]	17,13[illegible]	310,5[illegible] 27	77[illegible]¼	2,14[illegible]	[illegible]	147,4[illegible] 29¼	19,28[illegible] 71¼	458,05[illegible]	12	Crosses Sullivane Run on an embankment fifty-two feet high, and ends on the Patapsco at the head of tide water.
	13	13[illegible].06		244.7[illegible]*	. . .	. . .	6,925 24	317,49[illegible] 07	491	1,1[illegible]	27,117	148,65[illegible] 19¼	8,091 10	46[illegible]	13	Passes the Avalon Copper Works.
	14	97.3[illegible]	8	20[illegible]	. . .	. . .	1,161 15	318,65[illegible] 62	1[illegible]6	[illegible]	27,28[illegible]	149,00[illegible]	1,511 77	467,66[illegible] 44	14	
	15	199.30		22[illegible]	. . .	. . .	7,913 11	325,570 05	2,67[illegible]	13,424 81	29,9[illegible]	162,429 63¼	21,338 25¾	48[illegible] 94¼	15	Crosses Dorsey's Run and Ellicotts' Branch.
	16	65.88		290.2[illegible]	. . .	. . .	757 00	327,32[illegible] 06	20	35	[illegible]	162,164 63¼	792 60	48[illegible],792 29¼	16	
	17	143.52	9	116.76	. . .	. . .	5,921 20	333,248 86	1,510[illegible]	6,517 70	31,515¼	169,012 [illegible]3¼	12,468 90	502,291 19¼	17	Crosses Dismal Run.
	18	151.52		268.30	. . .	. . .	6,186 20	339,431 06	[illegible]	[illegible]	31,891	169,646 41	6,820 27¾	509,081 17	18	
	19	131.	10	79.40	. . .	. . .	12,040	351,475 06	2,877¼	10,124 40¾	34,769	179,770 51¼	22,164 10¾	531,245 57¼	19	Crosses Caton's Branch.
	20	133.24		212.34	. . .	. . .	4,188 36	355,66[illegible] 42	337¼	590 18¾	35,106¼	180,360 70¼	4,778 31¼	536,024 12¼	20	
	21	115.76	11	8.30	. . .	. . .	12,467 40	368,130 82	9,610¼	35,658 85	44,716¼	216,019 55¼	48,126 25	584,150 37¼	21	Crosses the Patapsco river over the Patterson Bridge twenty-eight feet above the surface of the water.
	22	116.20		154.30	. . .	. . .	3,284 36	371,415 [illegible]8	161	293 75	44,877¼	216,313 30¼	3,578 [illegible]	587,728 68¼	22	Passes Ellicotts' Factory and the Thistle Factory.
	23	139.28		293.78	. . .	. . .	1,392 80	372,808 18	165	288 75	45,042¼	216,602 05¼	1,681 55	589,410 23¼	23	
	24	139.44	12	113.22	. . .	. . .	1,391 40	374,202 58	274¾	474 68¾	45,314	217,076 74	1,869 08¾	591,27[illegible] 52	24	Ends opposite Gray's Factory.
	25	157.60		270.82	. . .	. . .	2,606 47	376,808 05	116¼	204 31¼	45,430¼	217,281 05¼	2,810 78¼	594,090 10¼	25	
	26	71.96	13	22.78	11,152	13,425	4,790 22¼	381,599 27¼	1,869¼	7,032 26¼	47,300¼	224,313 31¼	11,822 48¼	605,912 59	26	Ellicotts' Mills. This section crosses the Frederick turnpike road over the Oliver Viaduct of stone, and ends at the face of the abutment on the north side of said road.
Second	1	121.21		143.99*	. . .	. . .	10,058 75	391,658 02¼	621	1,552 25¼	47,921¼	225,865 55	11,610 98¼	617,523 57¼	1	Passes through the Tarpean Rock.
	2	139.48		283.47	. . .	. . .	4,184 50	395,842 52¼	813¾	2,820 40¼	48,735	228,685 95¼	7,004 90¼	624,528 48	2	Passes Ellicotts' Iron Works.
	3	150.96	14	114.47	. . .	. . .	1,061 72	396,904 24¼	84¾	153 61	48,819¾	228,839 56¼	1,215 33	625,743 81	3	Passes the Union Factory.
	4	152.16		266.59	. . .	. . .	1,936	398,840 24¼	98¼	216 18¼	48,918¼	229,055 75¼	2,152 18¼	627,895 99¾	4	
	5	133.16	15	79.75	. . .	. . .	1,202 15	400,042 39¼	114¼	227	49,032	229,282 75¼	1,429 15	629,325 14¾	5	
	6	115.26		195.01	. . .	. . .	3,256 09¾	403,298 49	22¾	50 06¾	49,054¾	229,332 81¼	3,306 15¾	632,631 30¼	6	Ends at the dam of the Union Factory.
	7	199.80	16	74.81	. . .	. . .	1,577 45	404,875 94	128¼	225 31¼	49,183	229,558 12¾	1,802 76¾	634,434 06¾	7	
	8	137.80		212.61	. . .	. . .	3,445	408,320 94	233	407 75	49,416	229,965 87¾	3,852 75	638,286 81¾	8	
	9	169.48	17	62.09	. . .	. . .	957 14	409,278 08	135¾	237 56¼	49,551¾	230,203 44	1,194 70¼	639,481 52	9	Crosses the old Frederick road on the same level at Ellicotts' old mills.
	10	161.80		223.89	. . .	. . .	2,434 39	411,712 47	143¾	274 22	49,695¼	230,447 66	2,708 61	642,190 13	10	
	11	186.40	18	93.29	. . .	. . .	5,725	417,437 47	52	91	49,747	230,5[illegible]8 66	5,816	648,006 13	11	
	12	60.60		153.89	. . .	. . .	211 80	417,649 27	....	...	49,747	230,5[illegible]8 66	211 80	648,217 93	12	Passes Elys' Factory.
	13	153.88		307.77	. . .	. . .	5,720	423,369 27	325¼	813 12¼	50,072¼	231,3[illegible]1 78¼	6,533 12¼	654,751 05¼	13	Passes Elys' Dam and ends at Dorsey's Lime Kilns.
	14	157.44	19	145.21	. . .	. . .	3,091 36	426,460 63	160¼	222 31	50,233	231,604 09	3,313 67¼	658,064 72¼	14	
	15	192.78	20	17.99	. . .	. . .	3,839 44	430,300 07	487	1,231 08¾	50,720	232,835 18	5,070 52¾	663,135 25¼	15	Ends opposite Dorsey's old mills.
	16	94.96		112.95	. . .	. . .	1,519 52	431,819 59	58	121 80	50,778	232,956 98¾	1,641 32	664,776 57¼	16	
	17	174.76		287.71	. . .	. . .	5,091	436,910 59	596	2,293 50	51,374	235,250 48¾	7,384 50	672,161 07¼	17	Crosses Dorsey's Run.
	18	72.16	21	39.87	. . .	. . .	1,298 88	438,209 47	499¼	1,942	51,873¼	237,192 48¾	3,240 88	675,401 95¼	18	
	19	162.32		202.19	. . .	. . .	6,898 60	445,108 07	324¾	649	52,198	237,841 48¾	7,547 60	682,949 55¼	19	
	20	154.80	22	36.99	. . .	. . .	3,870	448,978 07	1,621¼	5,756 37¼	53,819¼	243,597 86	9,626 37¼	692,575 93	20	Crosses Davis' Branch.
	21	156.24		193.23	. . .	. . .	3,906	452,884 07	270	675	54,089¼	244,272 86	4,581	697,156 93	21	
	22	103.76		296.99	. . .	. . .	1,037 60	453,921 67	182¼	456 25	54,271¼	244,729 11	1,493 85	698,650 78	22	
	23	158.88	23	111.87	. . .	. . .	4,685 80	458,607 47	270¼	676 25	54,542¼	245,405 36	5,362 05	704,012 83	23	Passes Davis' Tavern.
	24	130.88		241.75	. . .	. . .	6,020 48	464,627 95	1,409¼	4,823	55,951¼	250,228 36	10,843 48	714,856 31	24	Crosses Hammond's Branch.
	25	175.12	24	96.87	. . .	. . .	3,502 40	468,130 35	554¾	1,385 62¼	56,506	251,613 98¼	4,888 02¼	719,744 33¼	25	
	26	145.80		242.67	. . .	. . .	2,916	471,046 35	631¼	1,579 37¼	57,137¼	253,193 36	4,495 37¼	724,239 71	26	Ends opposite the Forks of the Patapsco.
Third	1	75.58		318.25	23,177	19,613	6,021 34	477,067 69	124¾	248 50	57,262	253,441 86	6,269 84	730,509 55	1	
	2	142.42	25	140.67	9,691	11,912	4,169 20	481,236 89	248	434	57,510	253,875 86	4,603 20	735,112 75	2	
	3	182.66	26	3.33	6,757	8,886	2,599 66	483,836 55	360¼	886 37¼	57,870¼	254,762 23¼	3,486 03¼	738,598 78¼	3	Ends at Marriottsville.
	4	145.45		148.78	8,625	6,325	2,415	486,251 55	78¾	137 81¼	57,949	254,900 04¾	2,552 81¼	741,151 59¾	4	
	5	127.27		276.05	10,939	13,441	5,314 35	491,565 90	1,257¾	5,311 68¼	59,206¾	260,211 73¼	10,626 03¼	751,777 63¼	5	Crosses the Patapsco over a stone bridge twenty-four feet above the water.
	6	88.	27	44.05	3,855	8,239	2,645 43	494,211 33	162	259 65	59,368¾	260,471 38¼	2,905 08	754,682 71¼	6	
	7	139.39		183.44	2,818	5,958	989 50	495,200 83	66	82 50	59,434¾	260,553 88¼	1,072	755,754 71¼	7	
	8	118.06		291.50	3,362	4,902	1,184 41	496,385 24	141	211 50	59,575¾	260,765 38¼	1,395 91	757,150 62¼	8	
	9	180.84	28	152.34	6,460	7,198	2,886 20	499,271 44	112¾	140 62¼	59,688¼	260,906 [illegible]	3,026 82¼	760,177 45	9	
	10	84.18		236.52	988	2,063	585 90	499,857 34	45¼	67 87¼	59,733¼	260,973 88¼	653 77¼	760,831 22¼	10	
	11	78.54		315.06	6,494	6,509	2,434 46	502,291 80	115¼	144 06¼	59,848¼	261,117 94¾	2,578 52¼	763,409 74¾	11	
	12	78.78	29	73.84	1,484	1,484	522 25	502,814 05	76¾	95 93¾	59,925¼	261,213 88¼	618 18¾	764,027 93¼	12	
	13	90.90		164.74	12,217	10,284	4,764 63	507,578 68	191¾	191 75	60,117¼	261,405 63¼	4,956 38	768,984 31¼	13	Pass fine granite quarries. (13–16)
	14	60.60		225.34	428	1,733	361 60	507,940 28	27¼	27 50	60,144¼	261,433 13¼	389 10	769,373 41¼	14	
	15	84.84		310.18	5,804	9,762	3,221 46	511,161 74	73¼	73 25	60,218	261,506 38¼	3,294 71	772,668 12¼	15	
	16	47.39	30	37.50	85	1,159	289 75	511,451 49	18¼	18 50	60,236¼	261,524 88¼	308 25	772,976 37¼	16	
	17	60.30		97.87	5,495	3,934	2,129 95	513,581 44	62¼	62 50	60,299	261,587 38¼	2,192 45	775,168 82¼	17	Ends at Sykesville.
	18	121.21		219.08	3,164	4,612	1,420 49	515,001 93	105¼	105 25	60,404¼	261,692 63¼	1,525 74	776,694 56¼	18	
	19	114.42	31	43.50	1,251	4,162	1,186 17	516,188 10	96¼	96 50	60,500¾	261,789 13¼	1,282 67	777,977 23¼	19	
	20	206.09		249.59	11,902	12,354	4,739 75	520,927 85	148¼	148 50	60,649¼	261,937 63¼	4,888 25	782,865 48¼	20	
	21	120.50	32	50.09	1,870	4,327	1,038 48	521,966 33	101¾	101 75	60,751	262,039 38¼	1,140 23	784,005 71¼	21	Passes through Shipley's low grounds. Relay House.
	22	119.14		169.23	5,698	8,403	2,100 75	524,067 08	296¼	714	61,047¼	262,753 38¼	2,814 75	786,820 46¼	22	Crosses Piney Run.
	23	145.45		314.68	1,658	11,804	2,431 40	526,498 48	95	95	61,142¼	262,848 38¼	2,526 40	789,346 86¼	23	
	24	119.94	33	114.62	4,159	4,315	1,510 25	528,008 73	96¼	144 37¼	61,238¾	262,992 76	1,654 62¼	791,001 49	24	Passes Hood's grist mills.
	25	78.78		193.40	4,341	2,383	1,606 17	529,614 90	66	111	61,304¾	263,103 76	1,717 17	792,718 66	25	Crosses Westminster road on the same level near Hood's saw mill.
	26	163.63	34	37.03	6,529	10,267	2,566 75	532,181 65	25¾	51 50	61,330¼	263,155 26	2,618 25	795,336 91	26	Ends at Cornelius Mercer's.
	27	121.21	35	38.24	3,364	24,706	6,864 15	539,045 80	65¼	81 56¼	61,395¾	263,236 82¼	6,945 71¼	802,282 62¼	27	Passes through Richard Mercer's land, and parallel with a new channel into which the Patapsco has been turned.
	28	111.93		180.17	1,396	[illegible]5,110	3,285 25	542,331 05	169¼	211 56¼	61,565	263,448 38¼	3,496 81¼	805,779 43¼	28	Crosses Deer's Run
	29	145.45	36	5.62	5,250	13,572	2,078 60	544,409 65	46¼	52 03	61,611¼	263,500 41¼	2,130 63	807,910 06¼	29	Crosses Lisbon road on the same level.
	30	41.33		46.95	369	817	122 55	544,532 20	55	61 87¼	61,666¼	263,562 29	184 42¼	808,094 49	30	
	31	145.45		192.40	5,867	13,861	3,488 03	548,020 23	889¼	2,392 87¼	62,555¾	26[illegible],955 [illegible]	5,880 90¼	813,975 39¼	31	Crosses Gillies' Falls over a stone bridge.
	32	161.75	37	34.15	6,555	5,725	1,871 60	549,891 83	95¼	404 77¼	62,651	266,059 94	1,976 37¼	815,951 77	32	Stolle Zepts.
	33	236.36		270.51	10,047	9,392	2,511 75	552,403 58	100	100	62,751	266,159 94	2,611 75	818,563 52	33	
	34	200.	38	150.51	6,081	9,027	2,478 48	554,882 06	110¼	110 50	62,861¼	266,270 44	2,588 98	821,152 50	34	Crosses Poplar Spring road on same level.
	35	284.84	39	115.35	9,872	6,800	2,623 54	557,505 60	176¼	176 25	63,037¾	266,446 69	2,799 79	823,952 29	35	
	36	115.15		230.50	2,424	6,809	2,79[illegible] [illegible]4	560,301 14	209¼	418 50	63,247	266,865 19	3,21[illegible]	827,166 33	36	
	37	133.33	40	43.83	3,858	7,640	2,175 70	562,476 84	158¼	316 50	63,405¼	267,181 69	2,492 20	829,6[illegible] 53	37	
	38	236.90		290.70	21,346	26,965	9,802 68	572,279 52	93¼	162 68¼	63,499	267,344 37¼	9,965 36¼	839,625 89¼	38	Inclined Plane, No. 1, on this section.
	39	133.34	41	94.07	11,191	19,781	5,503 86	577,783 38	1,264	4,453 25	64,763¼	271,797 62¼	9,957 11	849,583 00¼	39	Crosses Frederick turnpike road over a stone viaduct.
	40	151.69		255.76	9,323	7,313	5,023 77	582,807 15	162¼	227 75	64,925¼	272,025 37¼	5,251 52	854,834 52¼	40	On these sections is the Inclined Plane, No. 2. The 41st section ends on the summit of Parr's Ridge.
	41	121.20	42	26.96	7,390	8,897	2,571 58	585,378 73	71¾	112 25	64,998¼	272,137 62¼	2,683 83	857,518 35¼	41	
Fourth	1	250.30		257.26	21,961	20,971	9,249 64	594,628 37	193	374 42	65,191¼	272,512 04¼	9,62[illegible] 06	867,141 41¼	1	Inclined Plane, No. 3, is on this section.
	2	199.21	43	136.47	8,850	7,545	2,749 80	597,378 17	459¼	1,447	65,650¼	273,959 04¼	4,196 80	871,338 21¼	2	This section crosses Roderick Dorsey's mill pond, and ends at the head of Inclined Plane No. 4.
	3	222.78	44	39.25	7,129	21,694	7,669 58	605,047 75	265¼	929 75	65,9[illegible]	274,888 79¼	8,599 33	879,937 54¼	3	Inclined Plane, No. 4, is on this section.
	4	254.54		295.79	9,552	11,462	4,423 80	609,471 55	329	575 75	66,2[illegible]	275,464 54¼	4,999 55	88[illegible],9[illegible]7 09¼	4	Passes large brick tavern house.
	5	212.12	45	185.91	7,071	6,028	2,376 90	611,848 45	231¼	462 50	66,[illegible]	275,927 04¼	2,839 40	887,776 49¼	5	
	6	254.54	46	120.45	5,754	4,334	1,912 27	613,760 72	115¼	230 50	66,[illegible]	276,[illegible]57 54¼	2,142 7[illegible]	889,919 26¼	6	
	7	127.27		247.72	14,547	15,390	5,802 48	619,563 20	954¼	†3,400 70	67,3[illegible]	279,558 24¼	9,203 18	899,122 44¼	7	Crosses Bush creek over a stone bridge.
	8	163.63	47	91.35	7,050	6,156	2,301 68	621,864 88	205¼	359 18¾	67,[illegible]	279,917 43¼	2,660 86¾	901,783 31¼	8	
	9	200.		291.35	11,785	12,184	3,046	624,910 88	229	343 50	67,960¼	280,260 93¼	3,389 50	905,172 81¼	9	
	10	121.21	48	92.56	7,746	6,977	3,156 33	628,067 21	482	1,701 68¼	68,442	281,962 62¼	4,857 01¼	910,029 83¼	10	Ends at Cromie's Depot, about one mile south of Newmarket.
	11	193.33		285.89	10,802	12,185	4,424 13	632,491 34	205	307 50	68,647	282,270 12¼	4,731 63	914,761 46¼	11	Passes Smith & Anderson's mills, and Friends' Meeting House.
	12	151.51	49	117.40	15,510	16,511	7,648 53	640,139 87	491¼	1,085 91	69,139	283,356 03¼	8,734 44	923,495 90¼	12	
	13	193.33		301.73	12,504	14,421	11,395 56	651,535 43	284¼	790 56¼	69,423¼	284,146 59¼	12,186 12¼	935,682 02¼	13	
	14	139.39	50	130.12	7,857	9,129	3,232 23	654,767 66	191	238 43¾	69,614¼	284,385 03¼	3,470 66¼	939,152 69¼	14	Crosses Owings' lane on same level.
	15	90.90		221.02	7,052	9,973	3,376 51	658,144 17	64¼	96 75	69,678¼	284,481 78¼	3,473 26	942,625 95¼	15	
	16	193.93	51	94.95	12,992	14,670	10,625 24	668,769 41	181	271 50	69,859¼	284,753 28¼	10,896 74	953,522 69¼	16	
	17	249.49	52	24.44	9,240	17,452	3,315 88	672,085 29	290¼	435 75	70,150¼	285,189 03¼	3,751 63	957,274 32¼	17	Passes Ijams' mills, and Bantz's slate quarries.
	18	163.62		188.06	2,155	7,419	1,038 66	673,123 95	136¼	185 34¼	70,286¼	285,374 37¼	1,224 00¼	958,498 32¼	18	Crosses road to Johnston's glass works on same level.
	19	230.30	53	98.36	22,704	18,621	6,897 68	680,021 63	153¼	153 75	70,440¼	285,528 12¼	7,051 43	965,549 75¼	19	
	20	157.56		255.92	4,462	10,927	2,185 40	682,207 03	124¼	124 75	70,565¼	285,652 87¼	2,310 15	967,859 90¼	20	
	21	169.68	54	105.60	1,959	7,560	1,067 20	683,274 23	92	115	70,657¼	285,767 87¼	1,182 20	969,042 10¼	21	
	22	145.44		251.04	2,757	4,706	1,388 27	684,662 50	69¼	86 87¼	70,726¼	285,854 75	1,475 14¼	970,517 25	22	Passes Johnston's old Forge.
	23	115.14	55	46.18	3,453	5,492	1,086 40	685,748 90	33¼	37 40¼	70,760	285,892 15¼	1,123 80¼	971,641 05¼	23	Ends a few poles east of Reel's mills.
	24	200.		246.18	5,545	18,441	[illegible],892 85	689,641 75	381¼	572 25	71,141¼	286,464 40¼	[illegible],465 10	976,106 15¼	24	Passes Reel's mills.
	25	90.90	56	17.08	3,505	2,845	907 48	690,549 23	36¼	55 12¼	71,[illegible]78	286,519 53	962 60¼	977,068 76	25	Passes McPherson's mill dam.
	26	172.96		190.04	10,775	16,385	4,173 32	694,722 55	3,131	†18,864 83	74,309	305,384 36	23,038 15	1,000,106 91	26	Crosses the Monocacy river on a bridge of wood 350 feet long, and ends on the west bank of that river.
Fifth	1	175.66	57	45.70	14,247	39,824	8,209 13	702,931 68	[illegible]58	‡1,788 73	74,767	307,173 09	9,997 86	1,010,104 77	1	Crosses Georgetown and Frederick turnpike road under a wooden viaduct.
	2	274.84	58	0.54	15,593	13,740	2,518 40	705,450 08	1,698¼	4,958 62¼	76,465¼	312,131 71¼	7,47[illegible] 02¼	1,017,581 79¼	2	
	3	175.74		176.28	14,222	12,060	2,937 60	708,387 68	....	....	76,465¼	312,131 71¼	2,937 60	1,020,519 39¼	3	Ends at Ballinger's creek.
	4	157.56	59	13.84	5,204	5,230	735	709,122 68	32¼	40 31¼	76,497¼	312,172 02¼	775 31¼	1,021,294 70¼	4	
	5	115.14		128.98	2,224	1,622	622 72	709,745 40	17¼	22 18¾	76,515	312,194 21	644 90¾	1,021,939 61	5	Crosses Leesburg road on the same level.
	6	309.08	60	118.06	10,903	12,944	3,185	712,930 40	137¼	172 18¾	76,653	312,366 40	3,357 18¾	1,025,296 80	6	Crosses Colegate's branch.
	7	363.62	61	161.68	15,540	22,049	6,143 46	719,073 86	228	285	76,881	312,651 40	6,428 46	1,031,725 26	7	Crosses Leather's branch and Chapel road, the latter on the same level.
	8	278.78	62	120.46	15,998	12,973	6,160 55	725,234 41	48¼	60 93¾	76,929¼	312,712 34	6,221 48¾	1,037,946 75	8	Ends on the summit of Chapel Ridge.
	9	181.80		302.26	4,701	4,418	752 16	725,986 57	40¼	61 12¼	76,970¼	312,773 46¼	813 28¼	1,038,760 03¼	9	
	10	290.90	63	273.16	12,487	27,196	5,460 52	731,447 19	544¼	1,427 75	77,514¼	314,201 21¼	6,888 [illegible]7	1,045,64[illegible] [illegible]	10	Crosses Tuscarora creek.
	11	175.74	64	128.90	18,688	17,657	7,078 80	738,525 99	760¼	1,818 59¼	78,275¼	316,019 80¼	8,897 39¼	1,054,545 79¼	11	Crosses the Flag Pond branch.
	12	151.50		280.40	11,848	18,394	3,126 98	741,652 97	296¼	570 93¼	78,572¼	316,590 74¼	3,[illegible]97 91¼	1,058,[illegible] 71¼	12	Passes Andrew Michael's
	13	284.84	65	245.24	21,035	16,286	24,969 05	766,622 02	113	141 25	78,685¼	316,731 99¼	25,110 30	1,083,154 01¼	13	Passes through Marble Ridge.
	14	135.32	66	58.56	1,035	6,765	1,217 70	767,839 72	84¼	127 12¼	78,770	316,859 12	1,344 82¼	1,084,[illegible]98 84	14	
	15	218.18		276.74	4,071	7,285	1,529 85	769,369 57	176¼	265 12¼	78,946¼	31[illegible],[illegible]24 24¼	1,794 97¼	1,086,293 81¼	15	Crosses Trammel'stown road on same level.
	16	242.42	67	199.16	14,136	16,680	3,860 75	773,230 32	348	511 56¼	79,294¼	317,435 80	4,372 31¼	1,090,666 12¼	16	Ends at the "Point of Rocks" on the right bank of the river Potomac, and at the Chesapeake and Ohio Canal.
			56	200.04	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. .	
Lat'ral Road.	1	158.18	57	58.22	12,550	20,002	5,822	779,052 32	158¼	219 62¼	79,453¼	317,655 15¼	6,041 62¼	1,096,707 73¼	1	This section commences ten poles west of the Monocacy Bridge. The first and second sections run up the bank of the Monocacy.
	2	145.44		183.66	10,019	11,725	6,846 25	785,898 55	130¼	196 42¼	79,584	317,851 55¼	7,042 35¼	1,103,750 10¼	2	
	3	187.86	58	51.52	6,819	6,795	2,299 25	788,197 80	103¼	157 87¼	79,687¼	318,009 43¼	2,457 12¼	1,106,207 23¼	3	
	4	193.32		244.84	13,458	12,124	10,465 90	798,663 70	53	42 90	79,762¼	318,052 33¼	10,508 80	1,116,716 03¼	4	
	5	103.20	60	10.04	8,884	18,264	5,479 20	804,142 90	180¼	315 43¼	79,882¼	318,367 77	5,794 63¼	1,122,510 67	5	Ends at Frederick City.

* The 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25th sections of the First Division, and all the sections of the Second Division were contracted for by the pole, running measure, the quantity of excavation and embankment were not therefore measured.

† The amount of cost of the masonry on the 7th and 26th sections of the Fourth Division, also include the cost of superstructures of wood. That on the 7th section being a viaduct over McElfresh's road of twelve feet span, and that on the 26th being a bridge across the Monocacy river, of three arches of one hundred and ten feet chord each, the whole length being three hundred and fifty feet.

‡ In the cost of the masonry on the 1st section of the Fifth Division is included a wooden viaduct over the Rail road of twenty feet span, for the accommodation of the Frederick and Georgetown turnpike road.

RECAPITULATION

Designation of Division	Length of Division: Miles	Length of Division: Poles	Total distance from Pratt street, at which each Division terminates: Miles	Total distance: Poles	GRADUATION. Cubic yards of Excavation	GRADUATION. Cubic yards of Embankment	GRADUATION. Cubic yards actually handled	GRADUATION. Cost: Dolls. Cts.	MASONRY. No. of perches of 25 cubic feet	MASONRY. Cost: Dolls. Cts.	Aggregate cost of Graduation and Masonry of each Division: Dolls. Cts.	TERMINATION OF THE DIVISION
City	1	111.52	1	111.52	55,647	55,647	55,647	25,604 50¼	3,726¼	23[illegible] 81 37	[illegible] 56¼	First Stone or City Boundary.
First	11	231.46	13	22.78	*783,601	753,596	1,11[illegible]	355,994 6[illegible]	43,574	201,[illegible]31 91¼	557,22[illegible] 62¼	Ellicotts' Mills, on the north edge of the Frederick turnpike road.
Second	11	219.89	24	242.67	*200,822	289,852	[illegible]	89,447 07¼	9,[illegible]57¼	28,[illegible] 11	118,32[illegible] 12	Forks of the Patapsco.
Third	17	104.29	42	26.96	252,643	357,573	[illegible]	114,332 38	7,860¼	18,944 26¼	133,27[illegible] 64¼	On the summit of Parr's Ridge.
Fourth	14	165.08	56	190.04	234,455	297,278	[illegible]	109,343 82	9,210¼	33,246 73¼	142,590 55¼	West bank of the Monocacy river.
Fifth	11	9.12	67	199.16	179,93[illegible]	239,145	[illegible]	78,507 77	[illegible],035¼	12,051 44	90,559 21	"Point of Rocks," on the right bank of the river Potomac.
Lat'l Road	3	150.	60	10.04	51,540	65,910	70,24[illegible]	30,912 58	585	931 37	31,841 55	City of Frederick.
Totals	71	9.16	—	—	1,785,6[illegible]0	2,091,[illegible]90	2,510,7[illegible]	[illegible]	79,882¼	318,367 77	1,122,510 67	

The excavation and embankment on the 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25th sections of the First Division, and the whole of the Second Division, are estimated. The graduation of those parts was contracted for by the running pole, the excavation and embankment therefore were not measured.

ptomac

Statement showing the amount of damages paid and payable by the Baltimore and Ohio Rail Road Company, and the mode of ascertaining those damages.—Accompanying the Third Annual Report of CASPAR W. WEVER, Superintendent of Graduation acd Masonry.—1st October, 1832.

Name of landholder, tenant, or other person or corporation to whom paid.	How ascertained.	Locality.		Amount paid by Caspar W. Wever.		Evidence of Caspar W. Wever's payments.			Am'nt paid by other officers of the company and by the citizens of Frederick.		Amount to be paid.		REMARKS.
		Division.	Section.	Dollars.	Cents.	Account current.	Abstract.	Voucher.	Dollars.	Cents.	Dollars.	Cents.	
John Bausman	By agreement	City.	Eastern.	140	.	3	B.	1	. .	.	.	.	Injury to grass lot in the junction of Pratt street and Washington road.
Mary Brady	"	1	15	150	.	5	"	2	. .	.	.	.	Injury to her house and lot.
Moses Brown	"	. .	. . . .	19	.	7	"	6	. .	.	.	.	Damage by taking stone from his land.
J. M. P. Brien and H. McPherson	By a Jury*	5	2 & 3	2.000	.	11	"	2	. .	.	.	.	Right of way.
John Brien	"	5	1 & 2	1.287	.	11	"	17	. .	.	.	.	Right of way.
John Brien	"	L.R.	1, 2 & 3	. .	.	13	"	24	100	.	.	.	Right of way, paid by the citizens of Frederick.
John Brien	By agreement	. .	. . . .	255	25	13	"	26	. .	.	.	.	Privilege of taking stone from his land.
Samuel Beckwith	"	3	40	16	.	12	"	3	. .	.	.	.	Right of way.
Singleton Burgee	By a Jury	4	15 & 16	630	.	12	"	6	. .	.	.	.	Right of way.
Singleton Burgee	By agreement	4	15 & 16	50	.	13	"	6	. .	.	.	.	Burgee agrees to dispense with all wagon ways across the rail road except one.
Belt Brashear	By a Jury	4	8 & 9	175	.	12	"	17	. .	.	.	.	Right of way, &c.
Wilton Burditt	By agreement	3	38 & 39	110	.	13	"	10	. .	.	.	.	For damage in taking earth for embankments.
Wilton Burditt	By a Jury	3	38 & 39	. .	.	. .	.	. .	. .	.	500	.	Refuses to receive it. Right of way.
Vachel Brown	"	3	40	. .	.	. .	.	. .	. .	.	.	01	Right of way.
David Bussard	"	3	40	. .	.	. .	.	. .	. .	.	.	01	Right of way.
William Black	By agreement	2	1 & 2	. .	.	. .	.	. .	30	.	.	.	Right of way, &c.
Francis Beahmear	"	. .	. . . .	. .	.	. .	.	. .	146	.	.	.	Privilege of taking stone.
Anna Boyd	"	. .	. . . .	. .	.	. .	.	. .	400	.	.	.	
Marianne R. Champayne	"	. .	. . . .	100	.	9	"	1	. .	.	.	.	Privilege of taking stone.
John Colegate	"	5	6	30	.	14	"	8	. .	.	.	.	Damage to fences and crops. (A tenant on Carroll's Manor.)
Clerk of Frederick county	"	. .	. . . .	181	.	15	"	5	. .	.	.	.	Recording inquisitions and deed.
Samuel Clary	By a Jury	3	38	. .	.	. .	.	. .	. .	.	.	01	Right of way.
Heirs of Jacob Crum	"	L.R.	1, 2, 3, & 4	. .	.	. .	.	. .	250	.	.	.	Right of way. Paid by the citizens of Frederick.
Charles Cleever	. . . . .	. .	. . . .	. .	.	. .	.	. .	40	.	.	.	
Charles Carroll, of Carrollton	By arbitration	5	4,5,6,7,8,9,10	. .	.	. .	.	. .	3.376	53	.	.	Right of way. (Life estate.) Paid by the Treasurer.
Thomas Duvall	"	4	17 & 18	212	50	11	"	11	. .	.	.	.	Right of way.
Henry W. Dorsey	By a Jury	4	4, 5 & 6	300	.	12	"	25	. .	.	.	.	do.
Daniel Duvall	By agreement	5	15	130	.	12	"	26	. .	.	.	.	do.
Henry Doyle and J. McPherson	"	4	20, 21, 22 & 23	1.500	.	12	"	34	. .	.	.	.	do. and damage done mill seat.
Thomas Davis	By arbitration	3	36	60	.	13	"	9	. .	.	.	.	Damage by taking earth for embankment.
Thomas Davis	By a Jury	3	36	. .	.	. .	.	. .	. .	.	.	01	Right of way.
Elizabeth Davis	By agreement	4	17, 18, & 19	300	.	14	"	3	. .	.	.	.	Right of way and other damage.
Samuel Davis	By a Jury	3	34	. .	.	. .	.	. .	. .	.	.	01	do.
Roderick Dorsey	"	4	3 & 4	353	.	15	"	1	. .	.	.	.	do.
R. Dorsey and children	"	4	2 & 3	. .	.	. .	.	. .	. .	.	800	.	do. Legal impediments to the payment.
Jacob Doub	"	5	10 & 11	. .	.	. .	.	. .	. .	.	2	20	Refuses to receive the damage. (Tenant on Carroll's Manor.)
Caleb Davis	. . . . .	1	4 & 5	. .	.	. .	.	. .	500	.	.	.	
Heirs of Woodward Evett.	By a Jury	L.R.	5	. .	.	13	"	25	175	.	.	.	Right of way. Paid by the citizens of Frederick.
N. Ellicott	By agreement	. .	. . . .	. .	.	. .	.	. .	105	.	.	.	Damage done to a private road.
G. Ellicott	"	1	26	. .	.	. .	.	. .	500	.	.	.	For a dwelling house on Depot lot, relinquished to the company.
Owen Ehler	"	3	8 & 9	. .	.	. .	.	. .	250	.	.	.	Right of way, &c. Paid by James P. Stabler.
Frederick and Baltimore turnpike road, 1st crossing	"	1	26	25	.	10	"	8	. .	.	.	.	Paid James Fresh, for the repair of injury done to it.
do. do.	"	1	26	159	43¾	13	"	20	. .	.	.	.	Paul Simon Frieze, do. do.
do. 2d crossing	"	3	39	44	.	13	"	7	. .	.	.	.	Paid C. Middler, do. do.
do. do.	"	3	39	455	94	13	"	13	. .	.	.	.	Paid Jesse Greenfield for rebuilding masonry on it required by the President of [that company.
[illegible]	"	[illegible]	33 & 34	[illegible]	.	14	"	5	. .	.	.	.	
Thomas Flemming	"	3	38	20	.	12	"	36	. .	.	.	.	Damage to crops and fences. (Tenant on the lands of W. Halls' heirs.)
John Farmer	"	. .	. . . .	. .	.	. .	.	. .	80	.	.	.	
Georgetown and Frederick turnpike road	"	5	1	78	12	13	"	4	. .	.	.	.	Paid C. Middler, to repair damages done said road.
do. do.	"	5	1	63	.	13	"	11	. .	.	.	.	do. L. Weinwag, do do.
Frederick Grimes	By a Jury	3 4	41 1	80	.	12	"	30	. .	.	.	.	Right of way and part of the ground necessary for a Depot on the summit.
Cornelius Grimes	"	4	4	. .	.	. .	.	. .	. .	.	100	.	Right of way. Refused to receive the amount.
Cornelius Grimes and George Pusey	"	4	4	. .	.	. .	.	. .	. .	.	50	.	Right of way. C. Grimes refused to receive his part. The other party has [not been seen.
John Hanesworth	By agreement	1	4	13	.	1	"	2	. .	.	.	.	Damage to fences. (Tenant of Mr. Caton.)
William Hinks	"	2	1	100	.	6	"	1	. .	.	.	.	Right of way.
Daniel Hanesworth	"	1	. . . .	4	75	7	"	4	. .	.	.	.	Changing fence.
Priscilla Hanson	"	. .	. . . .	19	.	7	"	7	. .	.	.	.	For stone.
Hood's Mills	"	3	24 & 25	633	37½	10	"	2	. .	.	.	.	Paid Kassin & Otis, for repairing damages to mill races and roads.
Warfield Hall's heirs	By a Jury	3	37 & 38	. .	.	. .	.	. .	. .	.	110	.	The parties have not been seen. Right of way and ground necessary for a Depot.
William Hobbs	"	4	1	650	.	12	"	23	. .	.	.	.	Right of way and part of the ground necessary for a Depot on the summit.
Nicholas Hall's heirs	"	4	13	240	.	12	"	21	. .	.	.	.	Right of way.
Sally Hammond	"	2	24, 25 & 26	. .	.	. .	.	. .	180	01	.	.	do.
Plummer Ijams	By arbitration	4	17	41	.	11	"	14	. .	.	.	.	Removing an old log house.
do.	By agreement	4	17	98	80	13	"	19	. .	.	.	.	Damage to mill races and roads.
Joseph A. Johnson	By arbitration	5	15 & 16	415	43¾	15	"	6	. .	.	.	.	Damage to fences and crops. Right of way previously granted.
Ann Eleanor Langley	By agreement	1	6	10	.	1	"	1	. .	.	.	.	Damage to crops and fences. (A tenant.)
do.	"	1	6	30	.	2	"	1	. .	.	.	.	do. do. and garden. (do.)
G. and J. Knight	By arbitration	2	22 & 23	150	.	1	"	6	. .	.	.	.	Right of way.
Ann Krause	By agreement	. .	. . . .	150	.	7	"	1	. .	.	.	.	For building stone and the damage occasioned in removing them.
Milton Lamb	By arbitration	5	10	26	.	10	"	3	. .	.	.	.	Damage to crops. (A tenant on Carroll's Manor.)
Wm. R. King	By a Jury	5	13, 14 & 15	725	.	10	"	6	. .	.	.	.	Right of way.
J. Keefer	By agreement	5	3 & 4	80	.	11	"	25	. .	.	.	.	Damage to crops. (A tenant on Carroll's Manor.)
Lewis and Henry Kemp	"	5	8 & 9	100	.	12	"	9	. .	.	.	.	do. (do.)
Ann Landsdale	"	3	28 & 29	. .	.	. .	.	. .	280	.	.	.	Right of way.
Felix McCauly	"	. .	. . . .	31	25	6	"	2	. .	.	.	.	For stone.
saiah Mercer	By arbitration	. .	. . . .	197	50	7	"	3	. .	.	.	.	do.
Andrew Michael	By a Jury	5	12 & 13	1.000	.	10	"	5	. .	.	.	.	Right of way.
Sophia Mercer and Rob't. N. Nelson	By agreement	3	26 & 27	100	.	11	"	1	. .	.	.	.	do. and damage to fences.
H. McPherson and J. M. P. Brien	. . . . .	. .	. . . .	. .	.	. .	.	. .	. .	.	.	.	See J. M. P. Brien and H. McPherson.
Henry McElfresh	By a Jury	4	6, 7, & 8	1.150	.	12	"	5	. .	.	.	.	Right of way.
Caspar Mantz	"	4	5 & 6	80	.	12	"	7	. .	.	.	.	do.
Philip McElfresh	"	4	3 & 4	175	.	12	"	14	. .	.	.	.	do.
do.	By agreement	4	6	5	.	12	"	15	. .	.	.	.	Right of way through a very small corner of land.
. McPherson and H. Doyle.	. . . . .	. .	. . . .	. .	.	. .	.	. .	. .	.	.	.	See H. Doyle and J. McPherson.
acob Michael's heirs	By a Jury	5	11 & 12	352	.	12	"	35	. .	.	.	.	Right of way.
do.	By agreement	5	11 & 12	50	.	11	"	13	. .	.	.	.	To dispense with a pass way for stock allowed by the Jury.
Zachariah L. McElfresh	"	4	10 & 11	20	.	13	"	15	. .	.	.	.	Damage to crops. (A tenant on the lands of J. Pitt's heirs)
ane McElfresh	"	4	9 & 10	50	.	15	"	2	. .	.	.	.	Right of way.
R. N. Nelson and Sophia Mercer	. . . . .	. .	. . . .	. .	.	. .	.	. .	. .	.	.	.	See Sophia Mercer and R. N. Nelson.
sabella Nelson	By agreement	. .	. . . .	. .	.	. .	.	. .	26	50	.	.	For stone.
Thomas B. Owings	By a Jury	4	13 & 14	310	.	12	"	31	. .	.	.	.	Right of way.
William Partridge	By agreement	1	26	400	.	1	"	3	. .	.	.	.	Destruction of house and lot.
ohn Pitt's heirs	By a Jury	4	10 & 11	300	.	12	"	19	. .	.	.	.	Right of way.
G. Pusey and N. Grimes	. . . . .	. .	. . . .	. .	.	. .	.	. .	. .	.	.	.	See Nicholas Grimes and George Pusey.
Robert Packie	By arbitration	1	4	. .	.	. .	.	. .	60	.	.	.	Damage to crops.
Wm. P. Patterson	By agreement	. .	. . . .	. .	.	. .	.	. .	30	.	.	.	Right of way and privilege of changing the Annapolis road.
—— Reel	"	4	23 & 24	85	.	11	"	22	. .	.	.	.	Paid George Whip for removing Reel's barn and stables.
Abel Russel	By a Jury	4	13	200	.	12	"	22	. .	.	.	.	Right of way.
Davis Richardson	By agreement	5	6 & 7	200	.	12	"	33	. .	.	.	.	Damage to growing crops. (Tenant on H. Warring's land.)
Thomas Ratcliff's heirs	By a Jury	4	13 & 14	83	50	14	"	1	. .	.	.	.	Right of way.
Dennis A. Smith	By agreement	1	11	50	.	. .	.	. .	. .	.	.	.	For removing a nuisance, by filling pond occasioned by the rail road.
Jacob Shaffer	"	5	9	40	.	11	"	12	. .	.	.	.	Damage to crops. (Tenant on Carroll's Manor.)
Isaac Sams	"	. .	. . . .	8	.	13	"	1	. .	.	.	.	For stone.
Sheriff of Frederick county	. . . . .	. .	. . . .	774	50	12	"	27	. .	.	.	.	Summoning Jurors, &c.
Henry Smith	By a Jury	4	8	290	.	12	"	16	. .	.	.	.	Right of way.
John Smith	"	4	9	150	.	12	"	18	. .	.	.	.	do.
Thomas C. Shipley	"	4	11 & 12	502	50	12	"	20	. .	.	.	.	do.
Thomas C. Shipley and wife	"	4	12	437	50				. .	.	.	.	
Charles Stevens	"	4	11	. .	.	. .	.	. .	. .	.	1	.	Right of way. Refuses to receive the amount.
—— Schisler's heirs	"	L.R.	5	. .	.	. .	.	. .	5	.	.	.	Paid by the citizens of Frederick.
John Schrivenor	By agreement	3	5 & 6	. .	.	. .	.	. .	250	.	.	.	Right of way, &c. Paid by James P. Stabler.
Joshua Trimble	"	1	10	100	.	1	"	5	. .	.	.	.	Damage to inclosures and right of way.
do.	By arbitration	1	10	279	07	5	"	1	. .	.	.	.	Further damage in consequence of change of route of rail road.
do.	By agreement	1	10	25	60	8	"	3	. .	.	.	.	Removing fences for the temporary accommodution of the Washington road.
Joshua Trimble and wife	"	1	10	. .	.	. .	.	. .	700	.	.	.	Privilege to change Washington turnpike road and for a lot of land.
James Thomas	By arbitration	3	34 & 35	425	.	11	"	4	. .	.	.	.	Right of way and destruction of his dwelling house.
Benjamin Todd	By a Jury	4	3	25	.	12	"	24	. .	.	.	.	Right of way.
Ethelbert Tancy	"	5	10 & 11	77	80	10	"	7	. .	.	.	.	Right of way through a leasehold on Carroll's Manor.
Wm. W. Warfield	By agreement	3	29	65	.	11	"	19	. .	.	.	.	Damage to fences and right of way.
Clara Wootton	"	1	3	100	.	1	"	4	. .	.	.	.	Right of way and damage to timber and fences.
Wm. Wilcoxen	"	4	18	25	.	11	"	7	. .	.	.	.	do. do.
Henry Waring	By a Jury	5	4, 5, 6 & 7	1.500	.	11	"	8	. .	.	.	.	do. do.
Washington turnpike road	By agreement	1	10	506	75	8	"	2	. .	.	.	.	Paid Thomas Reel for changing the site of 91 $\frac{33}{100}$ poles of this road.
Washington Turnpike Company	"	1	10	. .	.	. .	.	. .	222	.	.	.	For privilege of changing site of road.
John S. Williams	"	2	23	. .	.	. .	.	. .	10	.	.	.	To repair his private road.
Marcella Worthington.	"	3	27	. .	.	. .	.	. .	150	.	.	.	Right of way.
Christopher Zepts	"	3	32	80	.	13	"	3	. .	.	.	.	Right of way and damage to fences.
Sundry persons				3.007	49	. .	.	. .	. .	.	.	.	For magistrates, arbitrators, and attorneys fees, and for constructing many county and farm roads across the rail road, and repairing other damages done by the rail road.
			Totals.	25.744	07						1.563	25	

* All condemnations by Juries, east of the middle of Inclined Plane No. 2, are of record in Baltimore and Anne Arundel counties—all west of said plane, are recorded in Frederick county.

(J.)

Office of Construction Balt. and Ohio Rail Road,
September 30, 1832.

To Philip E. Thomas,
President Balt. and Ohio Rail Road Company.

The following report of the operations of the department of Construction, for the past year, is respectfully submitted.

The Fifth Annual Report to the Stockholders, having been made during the unfinished state of a large portion of the work then under contract, and at a time when from other causes it was impracticable to enter as fully into a detail of the transactions of this department, as might have been desirable, only so much of these operations were embraced in that Report, as was necessary to show the general progress of the work up to that period. As, however, the work of *construction* intended to be completed during the present season, is now finished, and the facts and results to be derived from the portions actually constructed during the year, are in some measure dependent upon, and connected with, the parts executed prior to that time, it will be necessary in order to attain the knowledge of these results, to review some of the transactions relative to laying the rails, from the commencement of the work.

At the time when the Fourth Annual Report was made, a single track, and part of the second track, had been laid from the city of Baltimore to Ellicotts' Mills. A careful, and it is believed, accurate statement, was then given of the principal items entering into the cost of that work, and the various results stated, so far as it regarded the parts laid on wood sleepers and stone blocks. The stone road in the valley of the Patapsco, constituting the greater portion of the track remaining to be laid, although in progress, was not then finished, and some additional work was required on the parts laid with wood. The stone track on the second and third divisions, not having been completed by the 1st of October, 1831, the cost of that on the first division was not then given;—and for the same reason, the precise cost of the wood work laid subsequently to the publication of the Fourth Annual Report, was not stated in the Fifth Annual Report.

The tracks laid during the past year, will now be reported, and considered in connection with the other parts of the railway.

A revision of the former statements, applicable only to a small portion of the work, and a recurrence to some of the leading circumstances connected with the laying of the rails, is deemed not only essential in relation to the cost of the work which has already been executed, but desirable, for reasons connected with the future operations of the Company.

The expenditures upon a small portion of the railway, and those confined to a very limited extent of country, cannot afford as certain data for the future estimates of cost, as when the estimates are based upon the performance of a large extent of work,—executed under a greater variety of circumstances, and passing through sections of country affording varied facilities for construction. All these causes, and others which might be mentioned, have a direct influence upon the necessary expenditures; in consequence of which, certain items of cost stated in a former Report, will be seen to vary somewhat from the present. Some will be augmented, whilst others are diminished, and there will be included some charges not before stated. Changes have also been made in the form of certain parts of the work, which experience has suggested as proper; and these again have sometimes added to the expense, whilst in other instances they have decreased it. The average cost per mile, will, however, be found to approximate nearer to that sum which may in future be found requisite for the construction of the railway in its further progress to the Ohio, than if the estimate had been founded upon a more limited extent of operations.

The whole length of a single track now laid upon the Baltimore and Ohio rail road, exclusive of the sidings at the several depots at Baltimore and Ellicotts' Mills, is as follows:

In the city of Baltimore, commencing at the junction of Stiles and President streets, Old Town, uniting with the track in Pratt street, at the intersection of President street, and terminating at the depot at the west end of Pratt street, and including a portion of second track laid at the junction of the city track with the main stem, there has been laid $1.\frac{77}{100}$ miles.

On the City and First Divisions, including a siding on the first division, $14.\frac{17}{100}$ miles laid on sleepers,—$5.\frac{83}{100}$ miles on stone blocks,—and $6.\frac{08}{100}$ miles, of the track laid with stone sills.

On the second Division, there has been laid $22.\frac{25}{100}$ miles of the stone track, and $1.\frac{08}{100}$ miles of wood track.

On the Third Division, the extent of stone track is less than was intended to have been laid, and amounts to $5.\frac{51}{100}$ miles. The residue on that Division is laid with wood, on sleepers, and includes $29.\frac{21}{100}$ miles of single track. The double track on the Fourth Division, is laid with string pieces and sleepers, and is equal to $28.\frac{95}{100}$ miles of single track. About $1\frac{3}{8}$ miles of this track, is laid with log timber, procured from the adjacent country, and used in place of the six-inch scantling. One mile of the track on the same Division, is laid with the six-inch scantling having the sleepers laid three feet apart from centre to centre instead of four feet,—the distance adopted for the other parts o the road.

On the Fifth Division, a single track has been completed, an several detached portions of the second track, are also laid upo this division, amounting to $\frac{84}{100}$ miles, making the aggregate lengt of single track now laid, $11.\frac{94}{100}$ miles; and leaving $10.\frac{27}{100}$ miles of single track yet to be laid on that Division.

The lateral road to Frederick, consists of a single track, which, with the western fork that connects it with the main stem in a direction towards the Point of Rocks,—a siding mid-way between the main stem and Frederick, together with a small portion of the second and third tracks laid in the depot lot at the latter place, includes $4.\frac{20}{100}$ miles of single track.

The total amount of single track of wood Railway laid on sleepers, is therefore $89.\frac{55}{100}$ miles; on stone blocks $5.\frac{83}{100}$ miles,—and the aggregate length of stone track laid on the first, second, and third divisions, is $33.\frac{84}{100}$ miles, exclusive of the sidings and additional tracks laid at the depots at Baltimore and Ellicotts' mills.

From the foregoing lengths of single track, it is proposed to make a statement of the cost incurred on the wood and stone railway, respectively, ascertained from the known expenditures on parts of the work, and from estimates on other parts derived from data considered so nearly correct, as to make no important difference in the general result. The estimates referred to, are, for parts of the cost of the first or northern track laid on the city division. These expenditures were not accounted for with the requisite details, to admit of their being placed under the several heads as adopted for the work since executed. The variation between the estimated and actual cost, will be more in the *distribution* of the several sums amongst the respective parts, than in the aggregate amount. This track being formed to suit the flanges on the outside of the rails, required an alteration when the change for the position of the flanges was made. The actual expenses of that alteration are now included under the proper heads in the general cost.

But there are items of expenditure applicable to no other purpose than the construction of the railway, and these being known, constitute a specific charge against that part of the work. Amonst these items are included, payments and allowances to contractors—local superintendence—engineers' wages—services of vane bearers and axe-men—agents for hauling materials—hauling materials, tools, implements, and materials of particular descriptions—together with other, and contingent expenditures applicable to certain defined portions of the construction.*

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* In the term "Contingencies" is included some charges for stationary, printing and advertising; which it has not been found practicable to separate from the sums due to the *general charges for contingencies*. These sums, *however small*, are chargeable to *laying the rails;* but, as the amount is altogether unimportant when applied to the whole work, not exceeding a few cents per mile, they have not been included in the statement of cost for laying the rails: and should these charges have been made to *laying the rails*, they would be greatly overbalanced by sums which have been paid by this department for the use of other departments, for contingencies not applicable to the rail tracks, but which from the difficulty of making such nice distinctions have been charged to the construction of the railway.

There are also charges for services rendered in general superintendence—for stationary—and other contingent disbursements, chargeable to no particular portion of the railway, but due alike to the several kinds of work performed on the entire line of track now completed. The sums expended in this manner are applied in the statement, to the whole work, and cannot vary from the truth. But, some materials, procured for specific purposes in the construction of the railway, it has been found convenient and necessary to apply to other parts of the work. Scantling procured for the railway has been used for building,—for bridges,—for various parts of the machinery connected with the road, and for a variety of other purposes. The same may be said of the iron rails, portions of which have been used in the branch roads of the city, for sidings at depots, and for other purposes not included in the length of track now taken as a basis for the calculation of the cost of the railway.

These remarks will apply also to the spikes—plates—screw bolts—timber for the machinery at the planes,—scantling—sleepers—turnout castings—tools—instruments, and other items not enumerated, a part of which now remain on hand, available for the future operations of the company in repairs or construction. [See Appendix, J., Tabular statement, No. 2.]

Whilst, therefore, it would be proper to consider the materials which have been applied to other purposes, as well as those remaining on hand, and available for work yet to be performed, as constituting an off-set to the disbursements made on account of the general construction, it would not be right to place those expenditures to the cost of the work which has been fully completed; as would have been proper, had all the materials purchased, been applied to that purpose. No allusion is here made to necessary *loss* and *waste* of materials;—all of which, as contingent to the work, are properly chargeable to its construction, though not actually forming a component part of the superstructure.

The most careful inquiry has been made, of the appropriation of the various kinds of materials, of which a part has been used for other purposes, and of which portions remain on hand. [See Appendix, J., Statement, No. 2.] An estimate has also been made of the quantity of these materials, inclusive *of the most ample allowance* for waste and contingencies, which might be justly chargeable to the work now completed; and under ordinary circumstances, incident to a like extent of track in the future construction of the railway upon the Baltimore and Ohio rail road. This process has been considered necessary, in order to shew the relative expense of the different modes of construction,—whether of wood or stone, and whilst it may elucidate that part of the subject, it does not interfere with the ascertainment of the average cost per mile of the wood and stone railway, when they are considered together, as forming *a whole.* It may be proper here to remark, that although the length of single track on which the cost is given, is stated to be 129.$\frac{22}{100}$ miles, yet only 56.$\frac{59}{100}$ miles of that extent is of continuous double track, viz: from the depot at the west end of Pratt street, to a short distance west of the Monocacy viaduct.

Hence, as there is a difference of cost between the second and first tracks, allowing the price of workmanship to be the same on both,—owing to the superior facility of transporting the materials for the second track on the one already laid, a small variation may occur on that account, between the estimated and actual cost of the rails yet to be laid on the fifth division. But this difference may be considered as unimportant in favor of the second track, it being found that the drains for the centre of the road, necessary to be made only on the completion of the second track, (the cost of which is common to both tracks,) and other work contingent also to both, will tend to equalize the advantage in favour of the second track.

The whole amount of disbursements on account of the construction and repairs of the railway, together with incidental expenditures on account of graduation, masonry, and other items not properly chargeable to the railway, but necessarily made by the department having in charge the laying of the rails, has been as follows:

1. For 6×6 inch yellow pine and other scantling, and log stuff for string pieces, inclusive of the services of agents in procuring it, inspection, piling, handling, wharfage, ground rent for places of deposite, hauling to places of deposite in Baltimore and elsewhere, loading, and contingencies not classed as above, . - - - - - - - - $91,379.69

2. For sleepers of every description, including the same kind of charges made upon the scantling, - - $34,545.89

3. For plates, procured for placing under the adjoining ends of the iron rails on the wood track, and for screw bolts, including all expenses, delivered in Baltimore, - - $2,825.21

4. For stone blocks delivered on the road bed in the valley of the Patapsco, between Elkridge Landing and Ellicotts' Mills, - - - - - - - - $3,983.34

5. For iron rails, 2$\frac{1}{4}$ by $\frac{5}{8}$ thick, including sterling cost, and exchange at 11 per cent, - - - - - $124,085.37

6. For freight, insurance, storage, drayage, loading, scowage and contingent charges for delivery at depot in Baltimore, of said iron, - - - - - - - $17,144.23

7. For 133 bars of Liverpool edge rails, weight 10 tons, 8 cwt. 2 qr. 26 lb. inclusive of all expenses, delivered in Balt. $565.51

8. For chairs and bolts for said rails, inclusive of the same charges, - - - - - - - - - - $268.68

9. For English turnouts, inclusive of same charges, $2,024.14

10. For forgings and smith work for turnout castings, made in Baltimore, - - - - - - - - $2,323.40

11. For cast iron knees for stone block road, delivered at sundry places, - - - - - - - $2,422.24

12. For nails for cast knees, - - - - $442.42

13. For small nails for plates, - - - - - $341.86

14. For 4½ inch spikes for wood track, including charges for freight and drayage, - - - - - - $10,206.26

15. For 3½ inch spikes for stone road, inclusive of freight and charges, delivered in Baltimore, - - - - $4,461.12

16. For turnout castings, including each description of pattern, - - - - - - - - - - $6,247.72

17. For laying down turnouts, including superintendence, timber for turnouts, broken stone, tools, cutting and punching iron, spikes, moving tools and materials, and other contingent charges, - - - - - - - - - - $7,009.63

18. For amount paid to contractors for laying wood rails, at the *contract prices*, per rod of 16½ feet each, - $71,995.33

19. For amount paid for small culverts, shutes, and drains for the centre of the road, on the entire line between Baltimore and the Monocacy, (excepting on the inclined planes) $1,337.79

20. For contingent items chargeable to the wood track, not included in the contract price, per rod for laying the rails, viz. allowances for extra work required in securing foundations for stone blocks and sleepers—removing excavations, raising rails on embankments, making crossings for county and other roads, alterations required of contractors, clearing off and graduation of road bed for second track, contingent hauling, circular platforms for turning cars, protection and preservation of materials, cost of sundry tools and implements used on the work, and other items not enumerated, - - - - - - $8,538.31

21. For broken stone, for placing under the sleepers and stone blocks, - - - - - - - - - - $19,500.32

22. For hauling the wood and iron materials for all the wood railway, from the several depots to the sections and contracts on the several divisions, including the cost of loading, pay of agents for hauling, turnpike tolls, and items not enumerated, $34,210.80

23. For local superintendence, axemen, and vanebearers, on the wood railway, - - - - - - $9,268.05

24. For the services of Resident and assistant Engineers, in giving the levels and curves for laying wood rails, and for other assistants on the wood work, - - - $13,816.75

25. For contingent items not chargeable to either the wood or stone railway, separately, but common to both, in proportion to their respective lengths, being sums paid for instruments used in laying the rails, and for some belonging to the engineer and graduation departments—for repairing instruments; for stationary, printing, advertising, and general superintendence of laying rails and procurement of materials, - - $11,941.61

26. For laying stone rails at the *contract prices* per rod, upon the first, second, and third Divisions, - - $133,736.97

27. For amount paid the contractors for laying stone rails, fo extra broken stone for bedding the sills, per contract, for makin

crossings for county and other roads—allowance for extra work required for foundation for sills, removing excavations from trenches per contract, and contingent items not enumerated, $22,155.39

29. For hauling iron materials for stone track, $1184.33

30. For sundry expenses chargeable to stone railway, viz. for raising sills on side and thorough embankments, rendered necessary by the settling and sliding of the fillings,—for changes required in the work, not included in the contract prices,—allowances made to contractors on account of sundry work performed on their contracts, and loss of materials prepared on the third Division, including payments on sills not prepared (as explained in the last annual report) and implements worn out, $13,951.63

31. For local superintendence, vanebearers and axemen, on the stone road, - - - - - - $11,834.75

32. For Engineer's wages In giving levels and curvatures on the stone road, and other assistants measuring sills, broken stone, &c. - - - - - - - - $5,831.50

33. For amount paid contractors and others for the formation of the horse path, at the *contract prices* per rod, $31,263.84

34. For amount paid for additional materials required in the formation of the horse path, including expenses of assistants in procuring them, and contingent charges for the same service; the said materials including all the broken stone and gravel over and above that paid for in the preceding charge, $21,681.87

35. For tools and implements used in the construction and repairs of the road, railway, and horse-path, most of them now remaining in the service, in good order; and for workmanship on sleepers not yet used in the track, - - - $1,284.93

36. For materials and workmanship, to accommodate the machinery of the inclined planes, Parr's Ridge, consisting of the cost of timber and plank for chambers, procuring and hauling timber and plank, workmanship, tar, lead, work shop, castings, screw bolts, and contingent items not enumerated, but exclusive of any portion of said work chargeable to rail tracks, $9,417.01

37. For City rail track, including cost of laying rails, pavement, graduation and masonry, local superintendence, vanemen, axemen, and some contingent expenditures not enumerated, but exclusive of the cost of iron rails, spikes, and gutter irons, $32,551.91

38. For amount expended during the progress of construction of the railway, not chargeable to rail tracks, viz. For removing slips of earth, rock, &c. from the banks, increasing the width of road bed in narrow places, by the use of earth, rock, and side walls, raising the grade on embankments, and excavations in cuts, formation of ditches and drains, quarrying off points of rock, excavation of chambers for machinery at Parr's Ridge, and building masonry for ditto, timber for bridges over the railway, new culverts across the road bed, guard walls for security of bridges

culverts and embankments, damages for right of way, hauling materials for Monocacy viaduct. piling deep cut, thatching embankments with brush, removing waste earth from the several deep cuts on the first division, and for sundry items not classed with the above, - - - - - - - $53,126.32

39. For work done in dressing sleepers, and for the delivery of broken stone, and distribution of materials for the unlaid portions of second track on the fifth division of the road, $1,081.05

40. For repairs of road and railway, - - $2,067.97

Making the sum of	$822,055.14

As has been observed, it will be improper to state as the cost of the rail tracks finished, the whole of the above amount, or even all of those charges for *materials* which are applicable to the railway, because, there are portions yet unappropriated to that use, and some which have been applied to other purposes. [See Appendix J. statement No. 2.] It will therefore be necesessary to separate from the foregoing charges for materials, such proportion of the several kinds as have been actually applied to the work now finished, in order to show the true cost of the railway.

The scantling purchased, was 1,305.913 feet, running measure, at an average cost of $69.\frac{97}{100}$ per thousand feet, or say 7 cents per foot run.

The length of track laid with scanting, = $95.\frac{38}{100}$ miles, and would require 1,007,213 ft. nett measure. Add for turn-outs, keys, crossings for county roads, and waste, 940 feet pe mile, say 89,657 feet, and the amount charged to railway wil be, - - - - - - 1,096,870 ft

Remaining on hand at Depot Pratt street,	82,783
On 3d, 4th and 5th divisions, and lateral road,	62,000
Making together, - -	1,241,653 ft

Leaving 64,260 feet appropriated to other purposes as before mentioned. To each mile of road there will be charge 11,500 feet run, at 7 cents per foot, which gives as the cost o scantling, the sum of $805. per mile per single track.

The whole number of sleepers procured is 136,750 at a average of $252.\frac{62}{100}$ per thousand, or $25\frac{1}{4}$ cents each.

The length of track on which the sleepers have been used is the same as that for which the scantling is estimated, les the distance laid on stone blocks, viz. $95.\frac{38}{100}-5.\frac{83}{100} = 89.\frac{5}{10}$ miles laid on sleepers.

Sleepers required at 1320 per mile	118,206
Add for contingencies 30 sleepers per mile	2,686

Locust sleepers on 5th division not laid,	7,515	
Oak, &c. on 2d, 3d, and 4th div. and lat. road	7,000	14,515
Total,		135,407
There is supposed to have been used for sidings and other purposes, - - - -		1,343
Total number purchased,		136,750

1350 sleepers, at \$252.62 per thousand, = \$341.03 per mile for sleepers.

The whole number of plates procured was 83,279. They have been used on all the wood road, viz. on 95 $\frac{38}{100}$ miles. As they are more liable to waste than materials of larger size, 760 has been allowed per mile,—the true number required being only about 710. This allowance gives as the number of plates used, 72,564. There remains on hand 9,400, leaving a deficit of 1315 plates, which have probably been used on the sidings, and tracks laid in the several depot houses.—760 plates, at \$33.$\frac{92}{100}$ per thousand = \$25.78 cents per mile for plates.

15,440 stone blocks, cost \$3,983 $\frac{34}{100}$ ÷ 5.83 miles = \$683 $\frac{25}{100}$ per mile.

Amount paid for nails, for cast knees \$442.42. This sum ÷ 5. $\frac{83}{100}$ = \$75.89 per mile.

Amount paid for small nails for plates = \$341.$\frac{86}{100}$ ÷ 95.$\frac{38}{100}$ = \$3.$\frac{58}{100}$.

Upon counting the number of bars of iron on several successive miles of the road, the average number of bars exclusive of turnouts and crossings was found to be 710-11. To include all that could reasonably be estimated for loss, for turnouts and cross roads, the estimate will be made for 725 bars per mile. Each bar weighs, by an average of the whole number imported, 69.$\frac{13}{100}$ lb. = 22.37 tons per mile. The length of stone and wood track, laid on the 1st, 2d, 3d, 4th and 5th divisions and lateral road, taken as a basis for the estimate, is 95.$\frac{38}{100}$ + 33.$\frac{84}{100}$ = 129.$\frac{22}{100}$ miles. This would require of iron, - - 2891 tons.

There remains on hand about - - -	310
Used upon the city track, - - -	40
On lateral road, to Sweat's stone quarries,	35
Used at depots for sidings and branch tracks,	29
Branch roads in the city of Baltimore,	22
Total,	3327 tons.

Leaving about 200 bars, which have been used for repairs, circular platforms, and sundry other purposes connected with the road. The allowance over the nett quantity required on the length of track here estimated is between 50 and 60 tons. This is believed, to be sufficient for turnouts, and all contingencies that may be expected on a work of the kind.

The cost of the iron will therefore be stated at $\$37.\frac{22}{100}$ per ton + $\$5.\frac{14}{100}$ for freight, &c. = $\$42.\frac{36}{100}$ per ton, delivered in Baltimore.—$22.\frac{37}{100}$ tons, at $\$42.\frac{36}{100}$ per ton, = $\$947.\frac{59}{100}$ per mile, for the iron required for a single track, including turnouts, cross roads and contingencies.

Of the cast iron knees procured for the stone block road, there remains on hand from four to five thousand,—valued at about $300. The full amount purchased will be considered as contingent to the work, and the aggregate cost being $\$2{,}422.\frac{24}{100}$, that sum being divided by $5.\frac{83}{100}$ miles—the length of track laid with the stone blocks, gives as the average cost of the cast knees, per mile, $\$415.\frac{47}{100}$

The whole number of 4½ inch spikes purchased, has been 110,939lb. The nett quantity of the average size, required for a mile of track, is 950lb. As the 4½ in spikes are subject to greater loss than almost any other material, a more liberal allowance should be made for waste. In the estimates heretofore made, 5 per cent was thought to be sufficient, but to include all contingencies, 10 per cent. will now be allowed.

The wood track laid = 95.38 miles. This would require 90,611lb., to which add 10 per cent, or 9,061lb. =	99,672lb.
Remaining on hand, - - - -	6,665
Used for sidings at depots, - -	1,000
	107,337
Leaving, *used for other purposes, and not chargeable to the rail tracks, - - - -	3,602
Total purchased,	110,939

The average cost of the 4½ inch spikes has been $9.\frac{2}{10}$ cents. per lb. delivered in Baltimore. 1045lb. per mile, gives $96.14 per mile, for the 4½ inch spikes.

The whole number of 3½ in spikes procured, was 44,901lb.: the stone track did not require as many spikes as the wood track, by the deduction necessary for the holes missed near the joinings of the sills, and there has not been the same relative proportion of the 3½ inch spikes used for other purposes as o the 4½ inch. The allowance for contingencies and waste, will not therefore be as great. At 930lbs. per mile, with 70lbs

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* A part of this quantity was sold to the New Castle and Frenchtow Rail Road Company.

added for contingencies, each mile would require 1000lb., and

the track laid, - - - -		33,840 lb.
There has been used on the Pratt street track,		1,770
And remaining on hand, - - -		7,289
		42,899

Leaving 2002lb. to be accounted for. Those used on the Howard street track, and other branch roads in the city of Baltimore, will take a portion of this quantity, and the sidings at Ellicott's Mills, and other purposes for which they have been used by the company, the remainder. The average cost per pound was 9 $\frac{935}{1000}$ cents or $99.$\frac{35}{100}$ per thousand pounds. The sum of $99.$\frac{35}{100}$ per mile, will therefore be charged for the 3½ inch spikes.

The amount paid for turnout castings has been,		$6,247.72
For forgings, - - - -		2,323.40
		$8,571.12
Deduct for the value of castings on hand	$1038.39	
The same for forgings, - - -	434.66	1,473.05
Value of those used,		$7,098.07
Amount paid for laying down turnouts, for timber, posts,and superintendence of work, - - - -	$7,009.63	
Deduct for timber for turnouts now remaining on hand, 159 posts, at $1.25 cents each, - - -	198.75	$6,810.88
Total cost of turnouts laid,		$13,908 95

Counting each double turnout, as equal to two single turnouts, and two for sidings, to one whole turnout, there have been 87½ laid down. According to the original estimate, one turn out was due to each mile of double track. They have not yet been inserted in the main line according to that calculation, although a greater number have been made, than would be required, *in that proportion*, for the length of double track laid down. The additional number are inserted at the several depots and sidings, and are considered contingent to the work. The total cost divided by the number laid, gives as the average cost of each turnout $158. $\frac{96}{00}$, for materials, superintendence, and workmanship, but exclusive of iron bar iron and spikes;—those items being allowed for in the foregoing estimates.

The total length of wood track laid, as before stated = 95$\frac{38}{100}$ miles. The amount paid for workmanship, *at the contract prices per rod*, including the estimated value of laying and alteration of the northern track on the city division, = $71,995.33. This gives as the cost per mile, an average of $754.82 per mile or $2.36 per rod, for workmanship at *contract prices.* This however does not include all the work required of the contractors. An additional sum of $8,538.31 has been paid to them and others, for *contingent workmanship;* which sum divided by the length of wood track, will = $89.52 per mile, or 28 cents per rod. The entire cost of workmanship will then be $844.34 per mile, or $2.64 per rod. The number of perches of broken stone used for the stone blocks and sleepers together, has been $20,092.59. Its average cost per perch 96$\frac{18}{100}$cents, or 96.18 cents, for each hundred perches. The quantity used around the stone blocks, was 2351.$\frac{77}{100}$ perches. This sum divided by 5.$\frac{83}{100}$ miles, would give 405.$\frac{10}{100}$ perches per mile, which at $96.18 cents per perch, would amount to $389.62 per mile, for the broken stone required for that description of track. The residue of the wood railway required less broken stone. Deducting the value of that used with the stone blocks leaves $17.238.39 for the cost of the broken stone used under the sleepers. This divided by 89.$\frac{55}{100}$ miles, leaves the sum of $192.50 per mile for the broken stone. The quantity per mile = 200.$\frac{13}{100}$ perches, or nearly $\frac{1}{4}$ more than the esitmated quantity of 3 cubic feet to the sleeper.

The cost of distributing the iron and wood materials on the several Divisions for the wood track, was $34,210.80. The materials for which this charge for hauling accrued, have not all been applied to the construction of the railway. The charge is, however, contingent to the work and the whole amount will be included. $34,210.80 ÷ 95.$\frac{38}{100}$ miles = $358.$\frac{68}{100}$ per mile for hauling the materials, and applicable to both descriptions of the wood road. This sum is greatly over the stated cost of hauling the materials on the city and first divisions, given in the fourth Annual Report, which was but $210.$\frac{}{0}$ to $256.$\frac{}{0}$ per mile. It arose from the greater distance these materials were carried, and shews the propriety of estimating the average cost per mile, on a greater extent of work than could be noticed in that Report. The difference would have been still greater in the present instance, but for a part of the transportation having been effected on the tracks already laid, which were not available in the first instance.

The amount paid to local superintendents, vanebearers, and axemen, viz. $9,268.05 ÷ 95.$\frac{38}{100}$ miles = $97.$\frac{17}{100}$ per mile for that service.

The sum paid for the service of Engineers engaged in giving the levels and curves, and for some other assistants, has not before been charged to the cost of laying any part of the railway. That sum on the wood work,—including an estimated value for the service of superintendence on the north track on the City Division, amounts up to this date, to $\$13{,}816.\frac{75}{100}$. This sum divided by $95.\frac{38}{100}$ miles $= \$144.\frac{86}{100}$ per mile for Engineers' wages.

The general superintendence, and contingent expenses, have not heretofore been given. That sum, though not strictly applicable in the same ratio to each mile of track, will, nevertheless, be distributed equally throughout the work. The stone rails required more of these services in proportion to their length, than the wood work, as will be manifest on a reference to the sums expended for local superintendence, vanemen and axemen, on both kinds of track,—the one being $\$349.\frac{72}{100}$, and the other but $\$97.\frac{17}{100}$ per mile: but the difference would not, in this case, be important, even if accurately ascertained. From the sum paid, viz. from $\$11{,}941.\frac{61}{100}$, should be deducted the cost of the instruments on hand, and the sum paid for instruments and repairs of instruments belonging to other departments, to wit. $\$4{,}063.\frac{75}{100}$. These instruments, consisting of levels and compasses, are worth nearly, if not quite, their original value, and are in fact, that much available property. The interest on the investment is fully compensated, by the full charge being now made for staves, targets, chains, scales, office furniture and other apparatus, now on hand and in use, and available for the future operations of the company. This deduction would leave $7,877.86 as a charge for the items enumerated, or $60.96 per mile, for general superintendence and contingencies, exclusive of those contingencies embraced in the other parts of this statement, up to this day.

The length of the stone track taken as a basis for the estimate, is $33.\frac{84}{100}$ miles:—the amount paid at *contract prices*. = $133,736.97. This gives an average of $12.35 per rod, or $3,952.03 per mile for workmanship.

The amount paid for extra broken stone, and extra work required, $= \$22.155.39 \div 33.\frac{84}{100} = \$654.71$ per mile, or $2.04 per rod.

For hauling iron materials, $1,184.33 paid, $\div\ 33.\frac{84}{100} = \$35.$ per mile, or about 11 cents per rod.

For additional extra charges, $\$13{,}951.63 \div 33.\frac{84}{100} = 412.\frac{28}{100}$ per mile, or $1 54 cents per rod.

Local superintendence, axemen, and vane-men. The sum paid $= \$11{,}834.75 \div 33.\frac{84}{100} = 349.\frac{72}{100}$ per mile.

For engineers wages, the sum $\$5{,}831.50 \div 33.\frac{84}{100} = \$172\ 32$ per mile.

Amount paid for original formation of horse-path by *contract*, $=\$31,263.84 \div 129\frac{22}{100}$ miles $= \$241.94$ per mile, or $75\frac{6}{10}$ cents per rod.

Amount paid for additional materials and workmanship on horse-path, viz; $\$21,681.87 \div 129.\frac{22}{100} = \$167.79$ per mile, or $52\frac{4}{10}$ cents per rod.

The aggregate sum paid, viz: $\$31,263.84 + \$21,681.87 = \$52,945.71 \div \$129.22 = \$409.73$ per mile, as the whole cost per mile of the horse-path for a single track.

The length of the city track, exclusive of branch roads, is $1.\frac{77}{100}$ miles.

The expenditures of graduation for the rail track has been, - - - - - -	$4,243.75
For Pavement, - -	12,172.82
" Laying rails, - - -	14,232.55
" Masonry and contingencies,	1,902.79
" Iron rails, - - -	1,693.60
" Spikes, - - -	175.85
" Gutter irons, - - -	674.71
	$35,096.07

This sum divided by the length of track laid, will give the cost for introducing the railway into the city of Baltimore, at $\$19,828.\frac{28}{100}$ per mile, exclusive of the cost of location and surveys.

The cost of small culverts, including trunks and shutes, for draining the centre of the road bed, between Baltimore and the Monocacy river, or so far as the double track has been completed, except on the inclined planes, (where none are as yet inserted), has been $\$1,337.\frac{79}{100}$. This sum divided by the distance, viz: $54\frac{60}{100}$, gives as the cost of centre drains $= \$24.\frac{47}{100}$ per mile. The number inserted, has been 529 or about ten pe mile, at an average cost of $\$2.\frac{53}{100}$ each.

There will also be charged to the construction of the railway, the estimated sum of $\$7.\frac{73}{100}$ per mile for the wear and tea of cars furnished to the contractors, for the transportation o materials used in the construction of track and horse path.

Recapitulation

Of the cost of a mile of single track, laid on wood string and sleepers:

For String pieces, - - -	$805.00
Sleepers, - - - - - - -	341.03
Plates, - - - - - - - -	25.78

Small Nails for Plates,	3.58
Iron Rails,	947.59
4½ inch Spikes,	96.14
½ the cost of 1 Turn-out,	79.48
Workmanship,	754.82
Extra Workmanship,	89.52
½ the cost of Centre drains,	12.24
Broken Stone,	192.50
Hauling Materials,	358.68
Local superintendence, Vane-men and Axe-men,	97.17
Engineers wages,	144.86
Wear and Tear of Cars,	7.73
General superintendence and contingencies,	60.96
	$4,017.08

Recapitulaion

Of the cost of a mile of single track laid on wood strings and stone blocks:

String Pieces,	805.00
Stone Blocks,	683.25
Cast Knees,	415.47
Nails for Knees,	75.89
Plates,	25.78
Nails for Plates,	3.58
Iron Rails,	947.59
4½ inch spikes,	96.14
½ the cost of 1 Turn-out,	79.48
Workmanship,	754.82
Extra Workmanship,	89.52
½ the cost of Centre drains,	12.24
Broken stone,	389.62
Hauling Materials,	358.68
Local superintendence, Vane-men and Axe-men,	97.17
Engineers Wages,	144.86
Wear and tear of Cars,	7.73
General superintendence and contingencies,	60.96
	$5,047.78

Recapitulation

Of the cost of a mile of track laid on stone sills:

Workmanship—by contract,	$3,952.03
Contingent workmanship,	412.28
Extra broken stone, cross-ways, &c.,	654.71
Hauling iron materials,	35.00
½ the cost of centre drains,	12.24
½ the cost of 1 turn-out,	79.48
3½ inch spikes,	99.35
Local superintendence, vane men, and axe men,	349.72
Engineers services,	172.32
Iron rails,	947.59
Wear and tear of cars,	7.73
General superintendence and contingencies,	60.96
	$6,783.41*

In the estimates made by this department of the probable cost of the Rail way upon the Baltimore and Ohio Rail Road, a variety of expenditures were not included which now form items in the cost. The ascertained expense of the wood rails, laid on sleepers, upon the First Division, was stated in the Fourth Annual Report to be, about $4,002 per mile of single track; and of the wood rails laid on stone blocks about $5,115 per mile, exclusive of the horse path and of sundry charges not then ascertained, consisting principally of the cost of general superintendence—engineers services,—and some contingencies not considered as strictly applicable to the work then performed.

In the same Report, an estimate was made of the probable cost of the stone railway, founded upon the contract prices of the work then in progress and upon the most correct data that could be obtained from other sources. It was stated, that "under circumstances which might reasonably be expected to occur, the expense of the stone rails would not exceed $6,500. per mile, exclusive of horse path." Subsequently, however, and when it had been ascertained that contingent circumstances might increase the cost somewhat beyond the first estimates, it was stated in the fifth Annual report, that "the cost of the stone rails might possibly exceed that sum, on a considerable portion of the work." It was also stated in the same report that the wood rails would probably cost $5,000. per mile on the 3d, 4th, and 5th divisions, and the same on the lateral road to Frederick: and it was further stated in a recapitulation appended to the same report, that the entire cost of the railway from Baltimore to the Point of Rocks, inclusive of the lateral road to Frederick, would be $805,238. and that the average cost per mile of a single track for 138½ miles including the stone and wood track together, would probably be not less than $5,814. per mile, or $11,628. per mile for double track.

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*The cost of the stone road here stated, does not include the expense of placing plates underneath the adjoining ends of the iron rails, which it has been found necessary to incur. This sum will not exceed $175 per mile of track. The work is in progress, and very nearly completed.

From the foregoing statements and recapitulations for the several kinds of work, it will be perceived that the cost of a single track of railway, composed of the scantling and sleepers surmounted with the iron rails $2\frac{1}{4}$ inches wide, and $\frac{5}{8}$ of an inch thick, of $89.\frac{55}{100}$ miles in length has been constructed on the Baltimore and Ohio rail road including all contingencies, for the average sum of $\$4,017.\frac{08}{100}$ per mile. That a single track, with stone blocks substituted for the sleepers, of $5.\frac{83}{100}$ miles for the average sum of $\$5,047.\frac{78}{100}$ per mile; and that a single track of stone sills with the same kind of iron rails; has been made $33.\frac{84}{100}$ miles in length, at an average cost of $\$6,783.\frac{41}{100}$ per mile; and that the whole length of track now laid, taken together, viz: $129.\frac{22}{100}$ miles, will include an average cost of $\$4,788.\frac{03}{100}$ per mile for single track.

If to this sum be added the original cost per mile of the horse path, and the subsequent expenditures on the same, viz: $\$409.\frac{73}{100}$ per mile, the total average cost per mile of the single track of railway and horse path complete, will have been $\$5,197.\frac{76}{100}$ or, for the double track complete $\$10,395.\frac{51}{100}$ per mile *inclusive of all expenses.* [See Appendix J., Tabular Statement, No. 1.]

But, for reasons which have been stated to the Board, and by them considered sufficient to warrant the suspension of the work, *at present*, on the 5th division, there remains of the second track on that division, $10.\frac{27}{100}$ miles to be completed.

Should this work be finished at the average cost per mile for the other parts of the wood road,—and it is not doubted but it may be, as the greater part of the materials for this distance are on hand, and were obtained at the prices paid for those used in the work already executed, there will then have been completed $139.\frac{49}{100}$ miles of *single* track, at an average cost per mile of $5,141.00 or for the *double* track complete $10,282.00 per mile, including the horse path and all contingencies; [See Appendix J., Tabular Statement, No. 1.] and at an aggregate sum of $\$93,934.\frac{70}{100}$ less than the estimated cost as stated in the 4th and 5th annual Reports.*

When it is considered that many thousand dollars have been expended in the construction of the railway, not contemplated in the estimates, it must be no less gratifying to the Directors and to the Stockholders, than it has been to the Officers of the company according to whose design and under whose management it has been executed, that so large an amount of permanent work has been accomplished on this road in so short a time,—under circumstances of extraordinary difficulty and embarrassment,—and at an expenditure so much below the estimated cost.

Should it be deemed advisable hereafter, to adopt modifications of the present form of the railway, or even to change the mode of construction, a large part of the data now ascertained may be considered as a *constant quantity*, and with much confidence, may be relied on as a basis for future calculations. An exception, however, is here made in relation to the cost of laying the stone sills. From all the evidence had on the subject, I am satisfied, that the average cost per rod or mile, for a track of this description, has been estimated at two low a price to allow a fair compensation to the contractors.

The cost of the stone sills, would also be more liable to vary from any assumed standard, than the wood rails, inasmuch as the *material* and its transportation, involve a larger portion of the expense of the work, than any other material used on this road: and as this cost must be dependent upon local, and a variety of contingent circumstances, the estimates formed upon general calculations, cannot be relied on with the same certainty.

During the progress of construction of the work already executed, it has been found as was expected to be the case, that experience has suggested a variety of improvements, both in the mode of construction, and in the manner of executing the various details and manipulations, incident to a work of novel and somewhat complicated character. It has been ascertained, that certain parts of the railway, for which no more than a fair valuation was paid, for the time and labour expended by the

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* Estimated cost of 138½ miles, stated in 5th annual report,	$805,238.
Add for the then estimated cost of one mile of single track, now taken into the calculation. - - - - - - -	5,814.
	811,052.
Total cost of 139½ miles as the work has been and will be executed. - - - - - - - - - -	717,117.30
Sum less than estimated cost,	$93,934.70

mechanics and workmen, on the first division of the road, can now be executed at but little, if any, more than half the cost, either to the contractor or to the company. Much certainty depends upon the ability and enterprize of the workmen, but in this, as in all other cases, experience acquired in the handicraft arts, adds quite as much as *ingenuity*, to the facility and cheapness of execution. Upon the same principle, it has been discovered from time to time, that the engineers, superintendents, and other assistants on the work, acquire an expertness and prompitude to the execution of their respective duties, that tend greatly to benefit the work, and materially lessen its expenses. New plans and ways, for effecting the same object with greater certainty and to better effect, are continually suggested in the daily progress of construction; whilst experience confirms the propriety of adopting new modes, and devising substitutes for those plans and arrangements which have been found defective, or inapplicable in practice. The diminished cost of the work recently executed, when compared with that ascertained two years since, is mainly to be attributed to the operation of these causes. I do not, therefore, hesitate to say, that with the experience already acquired, a like extent of work may be again performed at a very considerably less expense than it has been done; and, that with the same expenditure of labour and money, much more may be effected. The truth of these remarks, has been illustrated in the necessary expenditures made in the construction of machinery, where numerous experiments were requisite, to determine the proper and most economical appropriation of materials, to the various purposes to which they were to be applied; and to test the relative merits of the different ways and means of accomplishing the object in view, to wit: *of attaining the greatest practical benefit with the least expense.*

This knowledge once obtained, the expenditures alluded to, no longer apply to the subsequent operations; or, at least, not to the same extent. With quite as much force do these remarks apply to the cost of "moving power" in the department of transportation; where, it has been ascertained that the relative expenses in different parts of the concern are much less *now* to effect a given quantity of work, than they were in the more early stages of its organization.

The positions here assumed are not, therefore, exclusively applicable to the construction of the railway. They have been found correct in almost every department of this company, and the knowledge of this fact, leads to the gratifying conclusion, that the expenses incurred in obtaining the information thus derived, may be rendered available in the further prosecution of the work. But, to reject every hypothetical statement upon the subject, and to consider only the actual expenses already incurred, to be due without abatement, to each successive portion of equal length of track yet to be laid on this road, it is manifest, that the entire cost of a double track, from the city of Baltimore to the Ohio river, constructed in the manner it has been done between Baltimore and the valley of the Potomac, may be reduced from the sum stated in the last Annual Report, to wit: from $11,628. per mile, to the sum of $10,282. per mile. Supposing, therefore, that the route to be yet determined, should extend the distance from Baltimore to the Ohio, to 350 miles, the aggregate sum less than the estimate, for which the double railway may be completed,—and supposed one year since to be actually necessary, will amount in that distance to $471,100.—a sum adequate to the entire construction of 107 miles of single track of railway, laid upon wood strings and sleepers, with the horse path complete. [See Appendix J. 3]

In the formation of the horse-path, on the city and first divisions of the road, it was considered expedient, to incur as small an expense in the first instance, as was consistent with the attainment of a reasonable facility and safety in the travel to which the road was at first subjected, as it was considered possible, if not probable, that steam power, might at no very distant period be substituted for animal power.

It was also expected, as proved to be the case, that with the utmost care in the formation of the embankments, considerable settlements must necessarily take place; and that in restoring the rails to their proper level, the horse-path would require additional materials: and however good these might be, their value would to a great extent be lost, in the repeated coverings necessary to retain the proper position of the path. For these an other reasons, it was desirable to expend as little in the firs construction of the path, as was practicable. It was foreseen also, that in some situations it would be impossible to form good path *at first*, and that it would require *successive layers* o the material, where no embankment existed; and, that a part o these layers would require *time* to become consolidated befor the others could be added. This circumstance rendered dela unavoidable in some instances in the completion of the path (as it could not be foreseen, what length of time it would require to apply the new covering to the greatest advantage,) an increased the original cost beyond the estimates made for th horse-path. Subsequently, it was perceived that a descriptio of material of soft texture which might answer every purpos during the summer season, and even during the winter, whe subjected to but a moderate travel and transportation, was n sufficient to withstand the action of more severe frost, especially when the travel became greatly increased. It was therefore indispensable that better materials, and those in greater quantities should be used, than were at first deemed requisite. Stone, to all appearance good, was found subject to decomposition when exposed to the action of wet and frost; and from the inclemency of the last season, the path on parts of the 4th and 5th divisions, could not be properly formed in time to admit the travel on the road, without incurring a heavy expenditure. Portions of inferior materials were therefore used for a temporary purpose, which subsequently were wholly removed, and an entire new path formed. Again, experience demonstrated the utility of a different formation of the path on certain parts of the road, to accommodate the transportation of burthens, and to economise the labour and moving power of the road in that department. This change required an addition of materials, which super-added to the other causes here recited, rendered it indispensable to expend more in the construction of the path than had been anticipated. These expenditures, are however, considered as conferring, ultimately, advantages in the construction of the path, very nearly in a direct ratio with the extent of the disbursement:—and if not to that full extent, they certainly afford the means of ascertaining important facts, by which, in the future operations of the company, expense may be saved, and greater stability attained under similar circumstances. The alteration in the form of the path last referred to, may be found beneficial on a greater extent of road, than that to which it has yet been subjected; and should that be the case, an additional expenditure in proportion to that extent, will be required. It may be proper here to observe, that from twelve to fifteen hundred perches of broken stone have been prepared for the alterations and completion of the path, which has not yet been applied to that purpose. The original cost of these materials has been included in the foregoing statement of \$409 $\frac{73}{100}$ per mile, for horse path. The labour hereafter required in the distribution of this broken stone, may partly be considered as due to original construction, and in some cases to a limited extent, may be ustly chargeable to *repairs*.

With regard generally to the construction of the railway, but more especially to the parts laid during the summer and fall of 1831, and also to the work already accomplished towards the ixtures for the machinery at the inclined planes at Parr's Ridge, performed at the same period, it may be remarked, that very considerable additional expense was incurred by prosecuting it o rapidly as was necessary to effectuate the opening before the winter, of the rail road communication between the cities of

Baltimore and Frederick, which was accomplished on the 1st of December of that year. The price of labor and materials both, are enhanced by the necessity of performing a given quantity of the former, and procuring a large supply of the latter, within a defined portion of time; and pre-eminently so, when circumstences render this period a short one. Work cannot be so *well* done, when hurried, as when a reasonable time is allowed, as has been proved in numerous instances in the progress of laying the rails, but especially in that part the most recently executed by O. H. W. Stull & Co , which, from causes beyond the control of the agents of the Company or the contractors, gave the latter a longer time to execute their work, than could be allowed in other cases. This circumstance, though unfavorable to a considerable extent, to the pecuniary interest of the contractor, is certainly, whenever available, greatly to the interest of the Company. It is not, however, to be understood that the expenditures incurred in the instances recited, have been thrown away. On the contrary, the most abundant proof has been furnished, that the advantages gained have greatly overbalanced the *extra* cost of the work, and would have warranted even much greater disbursements to accomplish the object, than have been actually made. The case is only mentioned to show, that if due attention is paid to those circumstances which so materially affect the cost of any great internal improvement, or other extensive work of public utility, it may be possible to reduce the expenses of construction still more, in the further progress of laying the rails on this road. A regular *system* of operations is indispensable to attain the full advantage of the expenditures on the construction, and this system cannot be attained unless the work is *uniformly progressive.* No little difficulty has been encountered during the progress of laying the rails, in the procurement of suitable engineers and assistants, for its superintendency. Numerous as these agents necessarily must be, whilst a great extent of work is in progress at the same time, they become dispersed at its completion; and when the work is again to be renewed, the same difficulty must then be encountered in training others to the service, and making them acquainted with the details and localities of the work. The benefits of experience are thus lost, both with regard to the engineers and other agents of the Company, as well as to the contractors, the mechanics, and even to the *laborers.*

Should it be possible, therefore, to define the work intende to be accomplished in each successive season, and sufficien time be allowed in the commencement, to make due provision in advance, for the requisite materials, it is believed a grea advantage would be gained both in the cost and permanence o the superstructure. The operations would become systematic in their character, and much less difficult in the details of execution.

The office of Superintendent of Construction, having been made to embrace not only the construction of the rail way, but keeping the road bed and rail way in repair; as also the execution of such further work as may be necessary to perfect the graduation of the road, it becomes necessary to notice the two latter subjects in this report.

First. *The Repairs of the Rail Way.*

During the progress of laying the rails on the several divisions, all the charges for changes made in the superstructure, have been included in the sums charged in the estimated cost of laying the track. On the wood rail way it has been found that some small alterations were necessary to be made in the form of construction;—defective timbers were occasionally inserted which it was deemed prudent to remove, and portions of the rails laid on embankments became deranged by the settlement of the ground.—The horse path in those and in other situations, was of course defective, and in some instances as has been stated, it was found impracticable to form at once a perfect path: All these items it has been deemed proper to charge to the construction, as they could not, legitimately, be considered as *Repairs.*

The raising of the stone sills to their proper level, even since the completion of the track, on thorough and side embankments, where the derangement had manifestly occurred in consequence of their imperfect foundation, and by the subsidence of the earth, has also been considered as a part of the original work, and charged in that portion of the cost under the head of "extra workmanship."

After the completion of a Division, and a reasonable time had lapsed, the raising of the wood rails, as well as the stone locks and stone sills, together with the necessary and con- ngent expenditures for keeping the track clear of obstruc- ons, have been considered as justly denominated "Repairs", nd have been so charged; yet the actual repairs required r the road, have hitherto formed a very inconsiderable em of expense. In no instance has a piece of heart tim- er—an iron rail, or plate given way; but several new ring pieces have been inserted on the First division where e iron rail had been suffered to rest upon the *sap* part the wood. This imperfection has arisen chiefly from carelessness in the workmen who laid the rails, and it is often found practicable to make the same timber answer, by merely changing its position, so as to place a sound part of the wood under the iron. A few of the stone sills have been found of bad quality, yielding to the pressure of the rail under the loaded car, whilst others have been found subject to the action of frost, and decomposition by atmospheric exposure. The renewal of the string pieces and the sills in these cases, are considered *Repairs;* and the expenditures have accordingly been carried to that account. Whilst it is admitted that from our limited experience, no very correct estimate of the probable annual cost of repairs, can yet be formed, I am fully of the opinion, judging from facts that have been developed within the two years past upon the Baltimore and Ohio Rail Road, most of which have occurred under my own immediate observation, that many of the objections which have been urged against the Rail road system, under the idea of the heavy repairs necessary upon such roads, as well as the apprehensions from "derangement of the rail way by the action of frost," during our inclement winters, are utterly groundless. The Baltimore and Ohio Rail Road has already encountered two of the most severe winters, that for many years have been known in this climate. During these periods, each description of rail way in use, has been subjected to the fullest trial, and the result has been, that whilst the action of frost has been found much greater on parts of the road newly graduated, than where the *surface* had been for some time exposed, and measurably consolidated by indiscriminate travel, the injury has even there been inconsiderable; and as the graduated surface of those parts left exposed by the superstructure, becomes compacted, the injury from frost will every year be less:—The interstices between the particles of broken stone used for a foundation, will become filled with the washings of sand and earth, and as this process is gradually carried on, the rails will, as has already been found to be the case, become more solid and unyielding—the frost will not sink so deep in the ground, and there will be less unequal settling of the sleepers, blocks, or sills.

The parts of wood and stone track particularly noticed during the winter of 1830, to be deranged by the frost, were agai noticed in the winter and spring of 1831, and were found at th last mentioned time to be scarcely any affected, although expose to a much more severe frost than had occurred at the time of th first observations. It has also been remarked, that during th last winter, when 100 miles of single track of this road had bee laid, and exposed to all the vicissitudes of a rigorous and u usually variable season,—much of it in an unfinished state—n being sufficiently drained nor protected by other precautions, that parts of it were raised by the frost about four inches above the foundation; during which time, it was constantly subjected, *without injury*, to the heaviest burthens admitted on the road. It was apprehended by many, that on the breaking up of the winter, both the sleeper and stone sill rail-ways, would be left in a very deranged condition, by the unequal settling to their foundations. With the exception of a few spots, extending not one quarter of a mile altogether in length, (at which points no side ditches had been made) on the frost subsiding, the rails settled down again to the same levels, and presented the track in nearly as good order as before the frost had acted upon them. On newly formed embankments, the surface and sides of the road bed had become impaired in some places by settling and abrasion, which rendered it necessary to raise the rails; but even on these embankments, no derangement took place offering any inconvenience or obstruction to the use of the road: It is also worthy of remark, that experience has proved on this road, that no delay or hindrance need be apprehended to the travel and transportation, whilst the railway is undergoing the requisite repairs. The various kinds of superstructure in use, have been subjected to every description of adjustment which can occur, and no inconvenience has yet resulted from the causes mentioned.

These observations have pointed out the proper means of guarding in a great measure against similar imperfections in the construction; and with respect to the work now completed, have demonstrated the circumstances under which, and the localities where, precautionary measures may be required. Indeed it is believed, that with but comparatively little additional expense, a railway may be constructed in such manner, and according to the character of the ground over which it may pass, so as to obviate *every* inconvenience which may be expected to result from derangement by the frost. A small portion of the railway upon the Baltimore and Ohio rail road, has been already constructed in this manner, and its security against any injury or derangement from this cause, has been so fully tested as no longer to admit of doubt on the subject.

2. *The additional work necessary to perfect the Graduation.*

For reasons which have been already made known to the Directors, it was deemed a matter of choice, if not of necessity, that the graduation of the road should be effected through the several deep cuttings, with such slope of the banks, and of such width of road bed only, as might with due care be sufficient to lay down the rail tracks, and secure the necestary drainage. This was thought advisable, both as a measure of prudence and of economy, and for the additional object of bringing a portion of the railway into more immediate operation. To have waited for the completion of the graduation of these portions of the road, before laying the rails, when no immediate or urgent inconvenience was apprehended to result from the course pursued, would have involved a delay altogether unnecessary, and in some respects vitally injurious to the interests of the Company. Besides, from the character of many parts of the excavation, it was believed that heavy expenditures might possibly be avoided, by leaving parts incomplete,—at least until time—the action of frost—rains—and other physical causes, had demonstrated the necessity of further labour. These remarks apply more particularly to the several deep cuttings on the first division, and on which division also, the highest embankments have been formed. It was expected that settlements and abrasions of these embankments would occur, and that the waste earth thus left in the cuts, with one operation might be removed to supply these deficiencies, which otherwise must have been remedied by earth procured elsewhere. It was, therefore, considered expedient to remove from time to time, only so much of the redundant earth, slips and washings of the banks, as was necessary to keep the track free from obstructions, and repair the abrasions of the embankments. This work has been in progress as occasion required, since the rails were laid. More yet remains to be done, but to what extent cannot now be accurately ascertained. Causes beyond the control of human agency, may exert an influence more or less powerful in favor of speedy or protracted efforts, to a final completion of this work. The extent and full operation of these causes, it is difficult to foresee and provide for, but they are known to exist in the diversified strata of all alluvial formations, and to considerable extent, in situations remote from the same influence.

It has been found indispensable in some places on the road, to build additional culverts to vent streams of running water, and also, to afford a passage in ravines subject to overflow by extraordinary rains and freshets. It is impossible to provide at once in all cases for contingencies of this kind, unless at an enormous and in some instances useless expenditure, on the masonry. With the utmost care and skill in the location, and the exercise of the soundest judgment in adopting the quantity of masonry to the indications of the country, it has been found, and will most likely again be seen, that every contingency cannot be provided for in the onset. The question is, therefore, whether it be better to wait for the few cases which may occur, to be met when the emergency arises, or to make an expenditure much greater, than time may prove to have been actually necessary? On a work of the magnitude of this road, where the masonry has been executed in a style of uncommon strength and solidity, as well as adaptation to the purposes intended, these subsequent and necessary expenditures have been very small compared with many works recently executed in this country. But some repairs and alterations are nevertheless common and contingent to the construction of all public improvements; to a greater or less extent, according to their character, location, and situation in which the first efforts to effect the object, leave them. This being the case on this, as well as on other works, some provision will be required with funds to meet them.

Another object contemplated in the provision alluded to, will be a portion of work, which experience has proved indispensable on this road, to wit: for increasing the width and depth of the side drains, so as to guard against inundations from sudden thaws of snow, and heavy falls of rain, and more effectually to counteract, or at least diminish, the action of frost. My observation of the effect of these causes upon the railway, fully justifies the conclusion, that the bottom of the side drains should be as much lower than the graduated surface of the road, as will prevent water from lodging in the foundations of the superstructure,—in fact, that the economy of the *farmer* in draining meadows, should be invariably applied to the construction of a Rail road. Greater permanence will thereby be attained, and the expense of adjustment and repairs to the rails, proportionally diminished. These views have been stated to show why it becomes necessary at the present time, to make provision for expenditures that may be unavoidable hereafter; not because the case has not been foreseen, but in consequence of the advanced state of the work at this time, affording the first opportunity that has occurred since its commencement, to make the requisite discrimination between the original cost of construction, and the repairs of the road.

The amount which may be probably required to effect these several objects, may be variously estimated according to the views which may be entertained of the extent and propriety of immediate or remote action in the several cases, where attention may be found requisite.

In closing this report, I consider it due to those assistants from whom the most important aid has been derived, to bear testimony to the faithful and assiduous manner in which they have generally discharged their respective duties.

On the completion of the work of laying the rails, on the Second division, John H. Wilson, Assistant Engineer in that service, was detailed to the superintendence of the track then being constructed in the city of Baltimore. Samuel Bogle has been employed in completing the graduation and superintending the repairs, on the City and First divisions. Norman McFarran and Peter Gorman have been continued to the same service on the Second division. The second track on part of the Third division has been finished under the superintendence of Joseph Shriver, Robert G. Bowie and George Matthews.

The completion of the second track on the remainder of the Third division,—the Fourth division, and parts of the Fifth division, has been under the immediate direction of my Principal assistant, John D. Steele, jr., aided by Samuel Brooke, Samuel J. Wilder, and George F. De La Roche; and for a short time in finishing the first track on the Fifth division, by Jonathan C. Price, George Holtzbecher, and Isaac Briggs.—Roger Howorth was also continued in the service during the winter of 1831—32 on the Fourth division: and for some time after the first of October 1831, Joseph B. Conard, Hopewell Dorsey, and Squire Whipple, were also employed on the Third division. Their services as Engineers, were highly satisfactory. Much credit is also due to Amos Farquhar and Ross Winans, for the very efficient manner in which their services were rendered during the months of October and November 1831, in the procurement of materials, and the erection of the chambers for the machinery at the incline planes. Since the termination of the service of O. H. W. Stull and Caleb Stabler, assistants mentioned in the last Annual Report, they became contractors for laying the second track of rails on part of the 3d, the 4th and 5th divisions, and by special agreement, they were to render the necessary aid in procuring the materials for the track. These duties they have performed to the extent required, with promptness and fidelity. I feel bound also to acknowledge the important aid derived from John Elgar, Engineer of Machinery, who has been engaged in superintending the construction of the Turn-outs, from the commencement of the work until July last. The superiority of his improved turn-out, (a drawing of which was given in the last Annual Report,) over any other as yet in use, and his indefatigable exertions in bringing to its present perfection this important improvement in the machinery of the Baltimore and Ohio Rail Road, deserve the highest commendation.

Respectfully, JAMES P. STABLER.

(J.) TABULAR STATEMENT, No. 4.

Shewing the average cost per mile for rail tracks—for horse path—the total cost of Railway and horse path—the total average cost per mile and the aggregate of Railway and horse path on each division—on the main stem—on the whole work now finished,—and on the whole work now finished and to be completed, between the city of Baltimore and the valley of the Potomac, and the same result including the lateral road to Frederick.

By JAMES P. STABLER, *Superintendent of Construction, September 30th, 1832.*

Division.	Length of Division.	Designation of track.	Length of Wood Track laid on each division.	Length of Stone Track laid on each division.	Cost per mile of single track.		Cost per mile of horse path.		Cost per mile of single track and horse path.		Cost per mile of double track and horse path.		Average cost per mile of single track on each division without the horse path.		Average cost per mile of double track on each division without the horse path.		Average cost per mile of single track on each division including horse path.		Average cost per mile on each division for double track including horse path.		Cost of Rails on each division.		Total cost of Railway on each division.		Total cost of horse path on each division.		Total cost of Railway and horse path on each division.		REMARKS.
No.	Miles.		Miles.	Miles.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	$	c.	
City and First.	13.04	Sleepers	14.47		4,017	08	409	73	4,426	84	8,853	62	4,892	40	9,781	80	5,302	13	10,604	26	56,922	02	127,593	71	10,685	76	138,279	47	$\frac{4}{5}$ Wood Track.
		Stone Blocks	5.83		5,047	78	409	73	5,457	51	10,915	02									29,428	55							
		Stone Sills		6.08	6,783	41	409	73	7,193	14	14,386	28									41,213	13							
2	11.66^{5}	Sleepers	1.08		4,017	08	409	73	4,426	81	8,853	62	6,655	35	13,310	70	7,065	08	14,130	16	4,338	45	155,269	32	9,559	00	164,828	32	$\frac{1}{25}$ Wood Track.
		Stone Sills		22.25	6,783	41	409	73	7,193	14	14,386	28									150,930	87							
3	17.36	Sleepers	29.21		4,017	08	409	73	4,426	81	8,853	62	4,456	09	8,912	18	4,865	82	9,731	64	117,338	91	154,715	50	14,225	83	168,941	33	$\frac{6}{7}$ Wood Track.
		Stone Sills		5.51	6,783	41	409	73	7,193	14	14,386	28									37,376	59							
4	14.47^{5}	Sleepers	28.95		4,017	08	409	73	4,426	81	8,853	62	4,017	08	8,034	16	4,426	81	8,853	62			116,291	47	11,861	68	128,156	15	Wood.
5	11.10^{5}	Sleepers	11.94		4,017	08	409	73	4,426	84	8,853	62	4,017	08	8,034	16	4,426	81	8,853	62			47,963	91	4,892	18	52,856	12	Wood.
	67.64^{5}		91.18	33.81																			601,836	94	51,221	15	653,061	39	Total now laid on main stem.
5	To be	laid	10.27	--	-		-		-		-		4,017	08	8,034	16	4,426	81	8,853	62	- -		41,255	41	4,207	93	45,463	34	To be laid on the 5th division.
															Total		Average		10,326	33	- -		643,092	35	55,432	38	698,524	73	Actual and estimated cost of Railway and horse path on the main stem from Baltimore to the [Potomac river.
Lateral Road	311		4.20	--	--		--		--		--		4,017	08			4,426	81			- -		16,871	74	1,720	87	18,592	61	Lateral Road.
			105.65												Total		Average		10,282	00			659,964	09	57,153	25	717,117	34	Total.

From the above Table it will be seen, that the length of wood track now laid on the main stem is 91.18 miles, and the length of stone track 33.84 miles, making together 125.02 miles. That the total cost of the railway and horse path now laid on the main stem has been $653,061.39. That if to the distance now laid, be added 10.27 miles yet to be laid, the total length of wood track will be 101.45 miles, and the total cost—including the stone railway and horse path, will have been $698,524.73. That the average cost per mile of double track on the main stem from Baltimore to the Point of Rocks, will be $10,326.33. That the cost of 129.22 miles of railway (without the horse path) now laid $618,708.68 at an average cost per mile for single track $\$4{,}788.\frac{03}{100}$. That the whole expenditures for the construction of 129.22 miles of rail way and horse path now laid, including the cost of the lateral road to Frederick, has been $671,654.00 at an average cost per mile for single track, of $\$5.197.\frac{76}{100}$, or $10,395.54 per mile for double track. That the whole expenditures for the railway and horse path on the main stem and lateral road together, when the double track on the 5th division shall have been finished, will have been $717,117.34, at an average cost per mile for double track, of $10,282.00.

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[J.]

(STATEMENT No. 2,)

Shewing the disbursements by the Department of Construction,—the sums expended on account of construction,—the sums expended for other purposes, not chargeable to railway,—and the value of materials and implements now on hand and available for the further uses of the Company. By JAMES P. STABLER, Sup't Con.—*Sept.* 30th, 1832.

DR.		
For this sum expended on account of construction, and for other purposes, - - - - - - -	$ 822.055	14
For this sum estimated for the wear and tear of cars used in the construction of 129 $\frac{22}{100}$ miles of railway, and included in the amount of $671.674, stated as the railway now laid, - - - - - - -	998	87
For this sum stated as the cost of culverts on 9$\frac{95}{100}$ miles of the double track, including the distance on the in clined planes, 5th division, and lateral road to Frederick, on which the culverts have not yet been constructed, the said sum being included in the amount stated as the cost of 129$\frac{22}{100}$ miles of single track now laid,	243	47
	$ 823.297	48
This sum to be added for small fractions, in estimated quantities of materials, carried out for the whole work,	14	40
- - - - - - - - -	$823.311	88

[J.]

(STATEMENT No. 2,)

Shewing the disbursements by the Department of Construction,—the sums expended on account of construction—the sums expended for other purposes, not chargeable to railway,—and the value of materials and implements now on hand and available for the further uses of the Company. By JAMES P. STABLER, Sup't Con.—*Sept.* 30*th*, 1832.

CR.

y $129\frac{22}{100}$ miles of track laid *a* $$5.197\frac{76}{100}$ per mile,	$ 671.654	00
y this sum chargeable to graduation and masonry,	53.126	32
Do. for accommodation of machinery at inclined planes,	9.034	23
Do. for materials for do. remaining on hand,	382	78
Do. introduction of railway into the city of Baltimore, exclusive of the cost of gutter irons for rail tracks, iron rails, and 3½ inch spikes,	32.551	91
Do. repairs of road and railway to 30th inst.	2.067	97
Do. work done towards track to be laid on 5th division,	1.081	05
Do. cost of English edge rails, chairs and bolts for do. and English turn-outs not charged to the construction of railway as above,	2.858	33
40 tons iron rails used on city track, Pratt-street,	1.693	60
22 do. do. branch roads in Baltimore,	931	92
35 do. lateral road to Sweat's quarries,	1.482	60
$35\frac{85}{100}$ do. for sidings and other purposes,	1.518	60
310 do. remaining on hand, - -	13.131	60
4.783 feet scantling on hand, - - - -	10.134	81
4.515 sleepers remaining on 3d, 4th, and 5th divisions,	3.666	77
5.665 lbs. 4½ inch spikes, on hand, - - -	613	18
7.289 lbs. 3½ do. do. - - - - -	724	16
.400 plates do. do. - - - - -	318	84
rn-out castings, forgings, and timber, not used,	1.671	80
I truments, and sums expended for do, for other depart'ts,	4.063	75
ols, instruments, &c. on hand, for repairs, - -	1.284	93
C struction of turn-outs at sidings and depots, - -	3 638	55
.260 feet scantling, used for other purposes than the railway, - - - - - - - -	4.498	20
1343 sleepers, used at sidings, &c. - - -	339	26
1315 plates do. do. - - -	44	59
4062 4½ in. spikes do. do. - - -	423	38
1770 lbs. 3½ spikes, used for city track, - -	175	85
2002 do. do. used for other purposes,	198	90
	$ 823.311	88

It will be seen by a reference to the reports of the Chief Engineer, and of the Superintendent of graduation and masonry, that the whole cost of the graduation and masonry *alone*, on the *main stem*, between Baltimore and the Point of Rocks, has been $\$1,090,666.\frac{12}{100}$; and that the cost of the graduation and masonsy, on the first division, extending thirteen miles, has been $\$605,912.\frac{59}{100}$. [See Appendix I 1.] The latter sum deducted from the former, leaves $\$484,753.\frac{53}{100}$, as the cost of the graduation and masonry on the 2d, 3d, 4th and 5th Divisions, or between Ellicotts' mills and the Point of Rocks,—a distance of about $54\frac{5}{8}$ miles.

The whole amount paid for right of way on five divisions has been $\$37,819.\frac{49}{100}$. [See Appendix H page 44.] O this sum, $\$4,427.\frac{36}{100}$ was paid on the First Division, leaving $\$33,392.\frac{13}{100}$, chargeable to the 2d, 3d, 4th and 5th-Division together, for right of way. Of this amount, the sum actuall paid in Frederick county alone—on about $25\frac{1}{2}$ miles of road way, was $\$20,880.\frac{39}{100}$; whilst in Baltimore and Anne Arunde counties together, including the line from Baltimore to the summit of Parr Spring Ridge,—a distance of 42 miles, there wa only paid $\$16,939.\frac{10}{100}$.

The charge made for contingencies in the graduation, [se Appendix H page 44] is $\$34,638.\frac{35}{100}$. If this amount be distributed, *per mile*, throughout the entire line from Baltimore t the Potomac, those divisions westward of Ellicotts' mill would bear too large a part of the sum. The expenditure on the graduation and masonry, in that department, wer $\$121,159.\frac{05}{100}$ more on the 1st division, than on the remaining divisions together; and it is well known that the amount paid fc superintendence, salaries of officers, and other contingencie was more nearly in proportion to the time occupied and th labour expended in the execution of the work. The amou paid for contingencies, will, therefore be distributed accor ing to the actual expenditures for graduation and masonr on these sub-divisions of the line, respectively: Thus, a $\$1,090,666.12 : \$34,638.35 :: \$484,753.53 ; \$15,395.24$.

There has also been expended on the graduation and masonr the sum of $\$52,626.\frac{32}{100}$, [see Appendix H, page 44] of whic about $31,500. was disbursed on the First division, leavin $\$21,126.\frac{32}{100}$, chargeable to the 2d, 3d, 4th and 5th divisio together.

These several charges—excluding those due to the First d vision, will show, that the entire cost of the graduation, maso ry, right of *way*, and contingencies, on the four divisions wes ward of Ellicotts' mills, to have been $\$554,667.\frac{22}{100}$, or at the rate of $\$10,158.\frac{74}{100}$ per mile.

The aggregate cost of the Rail way *as it is now laid* on the 2d, 3d, 4th and 5th divisions, and including the estimated cost of the rails yet to be laid on the Fifth division, is stated at $\$560,245.\frac{26}{100}$, [see Appendix J, Tabular statement No. 1] or, at an average cost per mile of $\$10,260.\frac{90}{100}$, for the double track.

The cost of the graduation and masonry—including the contingent charges before mentioned, added to the actual and estimated cost of the rail tracks, will therefore be $\$20,419.\frac{64}{100}$ per mile, for the full average and *actual* cost of the Rail road between Ellicotts' mills and the Potomac river. This sum, however, cannot with propriety be considered as the true average cost per mile, of a Rail road passing through a country possessing the same general features as the distance included in the above statement; because, however fair this average cost may be for the graduation and masonry, the sum charged to the Railway, is more than if it should be constructed according to the original plan, of wood strings and sleepers.

The distance embraced in the above statement includes $27\frac{3}{4}$ miles of single track of STONE rails, at an ascertained cost of $\$14,386.\frac{28}{100}$ per mile for double track; whilst the cost of the double track of wood rails laid on sleepers, and including horse paths, has been but $\$8,853.\frac{62}{100}$. If the last mentioned sum be added to the cost of graduation, it will show, that with a superstructure according to the original design, the road bed and rail way together, would have cost on this portion of the route, but $\$19,012.\frac{36}{100}$ per mile, or about $1,000. per mile less than the original estimate.

From the foregoing results, it now satisfactorily appears, that should no greater obstacles be found between the present termination of the Rail road at the "Point of Rocks," and the Ohio river, than has been overcome between Baltimore and the Potomac—and it is confidently believed that none greater will be found, that a Rail road between the Chesapeake Bay and the navigable waters of the West, may be constructed upon the plan originally proposed, and put into full operation with a double set of tracks, within six years from the time of its commencement; and at an expense not exceeding the original estimate of $20,000. per mile.

JAMES P. STABLER,
Supdt. of Construction.

[K.]

Office of the Superintendent of
Machinery, Sept. 29th 1832.

To Philip E. Thomas,
President of the Balt. & Ohio Rail Road Co.

In obedience to the rules and regulations for the governmen of the officers and agents of the Baltimore and Ohio Rail Roa Company, I now submit the following report of the departmen committed to my superintendence.

Soon after the travelling cars of the construction then generally in use had been placed upon this road, important defect were discovered in their running gears. The steeled axles o the friction-wheeled cars were found to wear so rapidly away and to involve so heavy an expense, from the necessity of frequent repairs, that it became indispensable, in order to obviat this inconvenience, that some means should be devised to effec an improvement in the construction of them. It was conceive that an advantage might be gained, by making the journals o the axles of case-hardened iron, instead of steel. The experiment was made, and it has fully succeeded.

It having also been found, that the use of the friction wheel in burden cars was attended with a heavy expense for repairs, plain chilled box has in many instances been substituted, b which an important saving is effected. So inconsiderable ha the friction been found to be on these boxes, that after the car have been running twelve, eighteen, or more months, they ar scarcely brought down to a smooth, uniform bearing; shewin indeed very little appearance of attrition.

Some improvement in the mode that had been used to kee the boxes properly oiled, was also found to be a very desirabl object to effect;—this has been attended with considerable difficulty. Several experiments were tried, the result of which wa but partially successful At length, the plan was adopted inserting a ring on the end of the axle, which ring turns in groove within the box. This by distributing the oil equally, an in due quantity, was found to obviate all inconvenience, and appears completely to answer the purpose.

From the very commencement of the Baltimore and Ohi Rail Road, it was fondly anticipated, as well by the public a large, as by those who were more immediately interested, tha steam power should be used in transportation. By the tim that our road had been constructed far enough to admit o making a trial of travelling upon it, the rail road system ha made considerable advances in England, and there steam powe had been used with great success. Glowing and flattering descriptions of the efficiency of British locomotives had reached this country, just at the time when the Rail-road system strongly laid hold on the public mind. In this state of feeling, the Rail Road Company were called upon immediately to import a complete English locomotive, of the most approved construction, for the double purpose of ascertaining by actual experiment, whether our Rail-road was adapted to the application of steam power, and also, if the experiment should prove successful, that it might serve as a model to American machinists. The President and Directors of the Baltimore and Ohio Rail Road Company, actuated by the laudable motive of encouraging and eliciting native talent and ingenuity, offered through the medium of the public journals, a premium for a locomotive engine, possessing certain specified powers, but limited with such conditions as to weight, size and other circumstances, that although some engines were produced, constructed under the stipulated limitations, it was found that they would not answer. The machinist, who in the first effort, had approached the nearest to the accomplishment of the object of constructing a locomotive possessing the requisite power and speed, was encouraged to attempt another, unrestricted by any conditions that would interfere with the effect. In consequence, an engine named the Atlantic, was in due time put upon the road for experiments; and after the trials necessary for the adjustment of the several parts one to the other, so as to produce harmonious action, and regulate the fan in such a manner as to keep up the heat to the proper degree of intensity, it was put upon actual service in the month of August last, and has continued to perform the trip of 80 miles daily, with the entire train of passenger cars, to and from the inclined planes, at an average rate of not less than twelve miles an hour; clearly demonstrating the practicability of employing steam power on this road to advantage, and most fully and satisfactorily proving, that when a sufficient number of engines shall be in active operation on the road, transportation may be performed by steam power, at about one half the cost of horse power. It would therefore appear, that the interests of the Rail Road Company are materially concerned in placing in operation, as soon as practicable, a number of efficient engines sufficient to secure the regular, uninterrupted line of travelling upon the road. Until this is done, it is apprehended that no reduction can be made in the expense connected with the present mode of transportation by horse power.

Previous to the 1st of March last, when the present superintendent of machinery was appointed, there were upon the road 363 burthen cars. Between that time and the present date, there

have been constructed 167 cars of the following descriptions, viz:
70 house cars for merchandize, at an average cost of $143.39
76 box cars with canvass covers for lime, flour, &c. do. 126.67
21 platform cars for lumber, stone, plaster, &c. do. do. 114.64
making the total number 530, nearly the whole of which are in good repair and fit for use.

The frequent loss of small and valuable articles of merchandize, and the occasional injury to such as were liable to damage from the weather, suggested the propriety of constructing the house cars, in which the goods might be preserved from depredation and injury. This improvement appears fully to answer the purpose; and while it has promoted the interests of the Company, it has met the public approbation. The cars are now constructed with a view to the different kinds of commodities conveyed on the road, and the brakes have been so improved, that transportation may be considered safe. Materials are provided, and the requisite arrangements made, to furnish within a short period the additional number of cars necessary to meet, not only the present exigency, but also any increased demand that can be reasonably calculated on for some time to come.

There are at present 36 passenger cars in good repair on the road;—two coaches are also now being built at the Company's shop on Charles street, which will shortly be ready for use.

The locomotive "York," which was in the first instance placed on the road as an experiment, is now undergoing a course of alterations and repairs, and is expected soon to be in a condition to ply between Baltimore and Ellicott's Mills. From the nature of the improvements now in progress, sanguine hopes are entertained that the performance of this engine will be efficient and satisfactory; and that its powers will be equal to the transportation of all the passengers on the first division of the road.

The experiments that have been made of the steel springs on the engine and tender, have furnished evidence of their utility in regulating the motion, and greatly diminishing the jar and consequent injury to the road. This has suggested the propriety of making a farther experiment, by placing a few of the burden cars on steel springs. By this improvement it is calculated, that a car thus fitted up with springs, will admit of one-third more loading, without any increase of damage to the road or car; and that it can be propelled by the same motive power, that the present fixture of the cars and their weight of load require. The passenger coaches can also be fitted up with springs at the same or even a less expense, than the present arrangement involves. In fitting up the burden cars with springs, an additional cost will be incurred; but the advantage gained, it is believed, will much more than compensate for the increased expenditure.

An improvement in the vibrating box is now about to be brought to the test of experiment. This will involve no additional cost; and in the opinion of those who are capable of judging in such matters, promises a favourable result, by affording in the motion of the cars, a more easy accommodation to the curvatures of the road.

For a detailed statement of the expenditures of this department, I refer to the annexed document, marked K. No. 1.

Respectfully submitted by
GEORGE GILLINGHAM,
Supt. of Machinery.
B. & O. R. R.

[DOCUMENT K. No. 1.]

An abstract of expenditures by George Gillingham, superintendent of machinery of the Baltimore and Ohio Rail Road, from the 1st of March to the 1st of October, 1832.

Expenditures for the repairs of burden cars, - - - -	$ 2,540	69
Expenditures for the repairs of passenger cars, - -	1,531	30
Total expenditures for repairs, - - - - · - -	$ 4,071	99
Expenditures for the construction of burden and passenger cars,	42,399	13½
Total expenditures in the department of machinery,	$46,471	12½

(L.)

Office of the Architect and Sup'dt. of Depots,
Balt. and Ohio Rail Road,

Baltimore, September 30, 1832.

To Philip E. Thomas,
President Balt. and Ohio Rail Road Company.

Sir—My appointment to the office of Architect and Superintendent of Depots, which took place on the 1st of October last, renders it proper that I should at this time, report the nature and progress of the work committed to my charge.

This report will embrace the erection of the necessary buildings and fixtures at the different depots of the company, the laying of railways for their accommodation, and the erection of stables at the established relays along the line of the road.

A substantial fire-proof four story brick warehouse, 50 feet by 80 feet, has been erected in Pratt near to Light street, which it is believed possesses all the fixtures necessary to facilitate the operations of the company at that place. A curved railway, on which cars enter the warehouse, has been laid from the main stem in Pratt street, into the house, and every requisite convenience for receiving and delivering merchandize there, has been constructed.

A granite stone sewer has been constructed at the intersection of Light with Pratt street, in order to meet the grade of the main stem of the railway, as directed by the Chief Engineer.

Additional sidings and turnouts have been laid down at the depot on West Pratt street, and a brick building has been erected there, for the deposite of oil, &c. as well as for a place of shelter for the car drivers in the winter.

The stone depot building at Ellicotts' Mills, as stated in my report of 30th September, 1831, has been completed, and is found well adapted to the business of the company at that place.

An iron balustrade, surmounting the Oliver Viaduct at Ellicotts' Mills, has been finished, which it is believed will render that structure perfectly secure for all the purposes for which it was intended.

Agreeably to the requisition of the Superintendent of Transportation, stables for the accommodation of the horses employed in the transportation of passengers and tonnage, have been erected at the different established relays along the line, viz. at Pratt street depot, Ellicotts' Mills, Dorsey's, Marriottsville, Sykesville, Shipley's, Zepp's, Plane No. 1, Parr's Ridge, Plane No. 4, Smith's, Littlejohn's, and at the depot, Frederick city. A dwelling has been erected at the foot of Plane No. 1, to which an addition is being made to accommodate the car drivers. An additional stable is also being erected at this point.

A frame dwelling has likewise been erected at the foot of Plane No. 4, and also an additional building for the accommodation of passengers, &c.

A well has been sunk at the Frederick depot for the use of the stables and steam engines, and a crane, with its necessary fixtures, has been erected for the use of that depot.

A substantial two story stone fire-proof building, 70 by 100 feet, is now being erected on the company's lot at Frederick city. This improvement, in addition to the necessary accommodations for a warehouse, will consist of a car-house with the requisite railways, turn-outs, &c. &c.

For the entire completion of this work, and for such other improvements, consisting of sidings, turnouts, &c. &c. as may be considered expedient and necessary, it is believed a sum not exceeding six thousand dollars will be required.

Respectfully submitted,

JACOB SMALL,

Architect and Sup'dt. of Depots, B. & O. R. R. Co.

(M.)

Office of Transportation
Baltimore and Ohio Rail Road Company,
1st October, 1832.

Philip E. Thomas, Esq.
President,

Sir—The period having arrived when it becomes necessary to report to you the transactions connected with the transportation on this road for the past year, the accompanying documents marked from M. No. 1, to M. No. 7, exhibiting in detail al the operations in that department, to the 1st October, are respectfully submitted to you.

The statement marked from M. No. 1, to No. 3, appertain exclusively, to the receipts of the Company,—by them it wil be observed, that the aggregate transportation effected durin the year, has consisted of 89.022 passengers, and of tonnage tons 41,086.2.3.14 lbs., producing a revenue of $136,937.70 whilst by the paper marked M. No. 4, it will appear tha the expenses incurred in their transportation, amounted t $69,534.47. The statements M. No. 5 and 6, exhibit th apportionment of the expenditures to the particular branch c revenue to which they respectively belong, as well as th subsequent net profits of such branch: to this document ar also appended the amounts disbursed, respectively, for the re pairs of the road, and of carriages and machinery, by the office at the head of the departments to which those duties belong:- and further, in the table M. No. 7, is presented a monthly deta of the various commodities, and of the aggregate tonnage (each, respectively, transported eastwardly on this road, durir the past year.

By reference to these papers, it will be found that the cost transportation has, for some months past, been materially red ced, whilst the commerce and general efficiency of the road hav been increased;—the immediate causes of the high rate of tl expenses, for some time after the road was extended to Fred rick, have already been made known; the most prominent these, was the withdrawal of the moving power of the Compa from their ordinary traffic, to the transportation of fuel for t supply of this city, at a time of an unprecedented scarcity that commodity.

The measure thus adopted by this Company, although co pletely successful in the highly important object contemplat was, as this description of transportation afforded no return loads, attended with a considerable diminution of their revenue:—it having been indispensable, also, that the public exigency should be promptly met, and the transportation effected almost without intermission, day and night, an augmentation in the expenses was unavoidable.

As the difficulties alluded to, as well as many others which arose from a want of experience in this system of intercommunication, and from the unpropitious season in which it was opened to the public, produced an unfavorable effect on the early business of the Company, the operations of that period, or even of the entire year in which they are embraced, cannot, it may be assumed, be received as any criterion of the prospective or of the actual condition of the commerce on the road;—in forming, therefore, any estimate of this kind, recourse ought rather to be had to a time when the embarrassments alluded to had ceased—namely, to the 1st of April,—from which date to the 1st October,—being an interval of six months—it will be seen, by reference to the tabular return M. No. 6, that the receipts were $91,002.68, and the expenses $38,286.14.

With a commerce not exceeding that now effected on the road,—the transportation also being performed exclusively by animal power,—the returns just referred to, may probably present a fair indication of the relative rates of the cost of transportation, and its revenue;—it is satisfactory, however, to know that, with the increase of business the ratio of the expenditures to the receipts will diminish, and that every accession of income must be attended with more than a corresponding augmentation in the net profits of the Company. This inference will be the more readily admitted, as it will be apparent that even a considerable increase of the transportation, requires solely a proportional addition to the moving power—the horses and drivers;—whilst a large amount of great, and, to a rail road, indispensable charges,—of agencies, depot and station expenses, and numerous other items, would not require any increase, with a very considerable accession to the business of the road.

The explanation which it is thus sought to make, is deemed the more necessary, as it will account for some apparent discrepancies in the tabular statement M. No. 5, where it will be perceived that, on several occasions, with only a slight increase or decrease in the comparative expenditures of certain months, there is a greatly disproportional result in their net profits,—thus, on referring to that statement, it will be seen that in the transportation of passengers for February and August, the difference in expense of those months, is only $350;* whilst the excess of the net revenue of August over that of February, is upwards of $4,900—and again in the transportation of tonnage, the expenses of July and September, only vary $629, whilst their net revenue differ $3317.

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* Unimportant fractions are omitted.

These results will appear the less incongruous, when it is recollected, that this rail road is subject to the expense of a series of inclined planes, and requires the constant support, on upwards of seventy miles, of a power adequate to a frequent, rapid and uninterrupted intercourse, day and night, for passengers as well as for tonnage,—a communication which, whilst it is maintained in the state of efficiency and activity required by the public, could not be supported, with even a reduced commerce, at a materially less cost, it is believed, than the expenditures stated, respectively, for passengers and tonnage for July and February: whilst, on the other hand, and from the operations of the causes already adverted to, had the business of those months even considerably exceeded their actual amounts, the expenses would, notwithstanding, have been comparatively but little enhanced.

It has been deemed proper to enter thus minutely into these details, not so much with a view of endeavoring to explain their effect on the past operations on the road, as to exhibit the favorable influence they will exercise on its future success;—and it is satisfactory to find that the additions which are constantly making, and which a more general knowledge of its facilities will continue to make, to the business of the road, must, beyond their increase of its revenue, be attended with the further advantage of adding still more to the profits of the Company, by diminishing the relative rate of the expenses to the receipts.

For some time after this road was extended to Frederick, (and it was one among its many early embarrassments,) the traffic was confined, almost exclusively, to the transportation of tonnage, eastwardly, whilst the trains proceeding westwardly, though attended with an equal expense, produced scarcely any returns. The injurious effect of such a system of business, on the revenue of that period, will be readily conceded:—it, in fact, not only deprived the Company of a commerce, which yields a higher toll than that in the opposite direction, but, in proportion as the transportation westwardly was withheld, a corresponding amount of eastern tonnage was also diverted from the rail road. The extent to which these disadvantages have been removed, may be inferred from the fact, that the aggregate amount received for tonnage forwarded from Baltimore to Frederick county, for the first three months after the road was opened to that point, did not yield an average of more than $652 for each month; whilst in September alone, the amount derived from the same source, exceeded $3,200.

The result just stated, although so decidedly favourable relatively to the past operations on the road, is, at the same time, an imperfect evidence of the extent of the general improvement that has been effected during the past season, and which the revenue of September would have exhibited, had it not, in common with the general commerce of the town, been materially curtailed by the pestilence which then prevailed.—On the appearance of that calamity here the receipts of the company suffered an immediate reduction of upwards of one-third, and on the very item, lately adverted to, of western tonnage, its injurious effect was at least as decided as on any other.

As the month of September may be regarded as the commencement of a new season of commerce, and as it would, therefore, have formed approximately, a criterion of the future business on the road, it would have been satisfactory, in this report, to have presented the returns which a full developement of its resources would have afforded;—but, under the disadvantages alluded to, it will, nevertheless, be perceived, that its revenue, from tonnage alone, has been $9,340; and that, although curtailed in its business, and only receiving the benefit of a partial revival of the transportation from Frederick and the Potomac, its receipts from that source have exceeded those of any previous month, by $934.

These results cannot but be considered as highly favorable to the future prospects of this work, indicating as they do, that the use of the rail road is becoming more extensively and exclusively adopted. It must, however, be remarked, that whilst many new and permanent sources of revenue have thus been obtained, there still remains a very large amount of tonnage, which, although passing parallel to this work, has not yet been attracted to it. The same facilities that have effected, and that are still producing, an increase of the commerce of the road, will, it may be presumed, gradually add this also to the other resources of this Company.

In order to insure to merchandise proceeding westwardly, greater despatch, arrangements were some time since made and carried into effect, to accomplish its delivery at the Point of Rocks, and Frederick, within twenty-four hours from its departure from Baltimore. Independent of the advantages which it was contemplated thus to afford to the public, by this increase of speed, it was presumed that it would offer to the proprietors of tonnage, now passing between Baltimore and the Ohio river, an adequate inducement to make the rail road the channel of communication for it, as far as between this city and Frederick, as it would materially reduce the time now required for its transportation in the established method. The plan proposed in relation to the Ohio trade, has been adopted in a few instances, by several individuals engaged in the forwarding of goods, and as a decided saving in the two important items of time and expense,* has resulted from the change, it may fairly be presumed that a more general transfer of the Western tonnage to the rail road, will gradually ensue—an acquisition that, from its magnitude, would produce a most important addition to the revenue of this Company, and, at the same time, greatly benefit the Western trade.

The rail road to the Point of Rocks—68½ miles from the depot in Baltimore, —was opened to the public on the 1st day of April last; but owing to the advanced state of the season, and to a change which had been recently established in the inspection of flour, a very limited accession to the tonnage of the road was for some months produced from this source;—since, however, more time has been afforded to remove the prejudices which ever exist against a new channel of communication, and an untried market, a considerable increase has taken place in this trade, and arrangements have been matured, on an extensive scale, for the transportation to this city of a large amount of produce, during the approaching season. The tonnage which it is expected that this road will thus conduct to Baltimore, being the product of that portion of Virginia continuous to the waters

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* It may not be irrelevant to this subject to state the data on which this assertion has been made:—The rates of transportation, including all the incidental charges made by this Company, are as follows, viz.

From Frederick to Howard street, or to the depot near to Light street wharf in Baltimore, the charge is 12¼ cents for 100 lbs.—and from the last named places to Frederick, it is 17½ cents.

The distance by the turnpike being 45 miles, or upwards of one-sixth of the entire distance to Wheeling from Baltimore; therefore,

EASTWARDLY,

The freight from Wheeling to Baltimore having been ascertained to be $1.25 per 100 lbs., one-sixth would be - -	21 cents
The charge by the Rail Road being - - -	12¼ "
Saving, - cents	8¾

WESTWARDLY,

The freight from Baltimore to Wheeling, as published on the 29th September, being $2.00 per 100 lbs., one-sixth would be	33½
The charge by the Rail Road being - - -	17½
Saving, - cents	16
Saving on each 100 lbs. in both directions, - -	$00.24¾
Or on the entire wagon load of 4500 lbs. - -	$11.13

of the Potomac and the Shenandoah, has, with few exceptions, been heretofore directed to other markets, and on this account, it is a subject of more decided interest, as it may, in reference to this city, be regarded as a new source of business that has been secured to it. In amount it had hitherto been insignificant, but it is increasing; and it is, moreover, the commencement of a participation in a highly important commerce, which cannot but yearly become more valuable.

The Rail road in its progress to Frederick could not make any considerable additions to the mercantile resources of this city, it merely diminished the cost of transportation to a Trade that it already possessed;—this result has, however, been greatly exceeded by its extension to the Potomac, it has there reached the confines of a section of country of great extent and fertility to which Baltimore, for its various and extensive exports, was almost an untried market. It is the first point, in its progress westwardly, at which this work has been enabled, in any decided degree, to accomplish one of the primary objects of its institution:—having now reached the Potomac, where it is first placed in contact with the channel of a new and vast commerce, every step, in addition to the present extent of this work, must realize those objects in an increased degree, and bind it more intimately to the fertile and extensive region adverted to.

During the past year great activity has prevailed throughout the line of Road in developing its mineral resources; and quarries, in its immediate contiguity—of granite, limestone and soapstone, have been opened and worked with energy. By the Returns in Table M No. 7, it will be seen that during the year 5,512 tons, equal to 77,168 cubic feet of granite, have been transported:—as the use of this commodity is daily extending, and as it, as well as lime, have become exports from Baltimore, an increased commerce may be anticipated from them.

Among the means which have been resorted to, to diminish the expenses of transportation, may be mentioned the adoption of a plan,—previously, however, employed on other similar works,—of using the gravity of the load as its moving power, where the plane of the descent admitted of it, and transporting the horses on platforms. The same means have also been adopted on portions of the Road where a part of the power, either from the diminished load in one direction or from the descending grade of the road, can be dispensed with. The economy resulting from this arrangement has, in the instance first named, amounted to one-half of the power previously found necessary—the saving of time has also been considerable, as the train, instead of travelling at the usual rate of heavy transportation, proceeds with safety at a speed of seven or eight miles an hour.

A most important result is derived from the plan described; the disadvantages attending of an undulating grade of Road, are by it neutralized; and the spontaneous descent of the load in one direction, places such a road, with regard to the efficiency of its power* and its expense of transportation, nearly on an equality with a level road.

The cases to which the above remarks have more immediate reference are those in which the Tonnage may be equal or nearly so, in both directions:—where, however, the descending line of Rail way is also that of the heaviest Train, the expense of Transportation will be proportionally less than on a level road.

During the period that this road has been opened to Frederick, embracing a winter of almost unprecedented severity, the intercourse has been sustained without interruption, and the communication for Passengers has been maintained with rarely any deviation from the speed of ten miles an hour. Throughout the above line, Post offices have been established, mails being delivered and received at each office daily;—and in order further to increase the facilities of public intercourse, four lines of passenger cars pass daily over the road, affording, for the despatch of individual business, the opportunity of proceeding from one extremity of the road to the other, and, after the lapse of two or three hours, of returning on the same day.

For the purpose of ascertaining, practically and conclusively, the applicability of steam power on this road, and with the farther view of testing its comparative expense and advantages with animal power, a series of experiments was on the 21st August, instituted and continued for the space of thirty days.

A locomotive steam engine, the "Atlantic," which had recently been constructed by Messrs. Davis and Gartner, of York, Pennsylvania, was employed for testing this important and interesting question.

This engine weighed 5½ tons exclusive of water,—it had two cylinders, of 10 inches diameter each, with a stroke of 20 inches, and, in order to increase its velocity, it was geared in the ratio of 2 to 1, working on road wheels of three feet diamter.

The "Atlantic" being intended for a high speed, its operations were accordingly, directed to the transportation of passengers between Baltimore and the foot of the inclined planes, it passed twice over that portion of the road daily, being a distance of about 80 miles, and transported the regular train of cars engaged in that business, consisting generally of five cars, carrying, according to the extent of the current business of the day, from 50 to 100 passengers—the load weighing, exclusive of the engine and tender, about 18 tons. Throughout the line thus traversed, curves are of frequent recurrence, several having a radius of only 400 feet, and the grade of the road, with the exception of 8 miles, is undulating,—the extreme ratio of ascent being 47 feet per mile The fuel was anthracite coal.

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* There is a slight and unimportant difference, occasioned by the draft of the empty platforms, on the ascent, to convey the horses on their return.

The operations of this engine were continued to the termination of the period designated for them, with the most triumphant success. The speed of 10, 12 and 15 miles, to which considerations of prudence had limited its average performance, was uniformly maintained, in extreme curves, as well as on extreme ascents;—neither of which produced any perceptible retarding effect. The steam was always redundant.

Mr. Gillingham, the superintendent of machinery of this Company, under whose direction the above experiments were made, has furnished the following details, viz: During the space of the thirty days, the operations of the engine were suspended for only seven days, which were consumed in repacking the piston, and in some unimportant repairs upon the wheels and carriage; the daily consumption of water was 1700 gallons, and of coal one ton; the services of a principal and an assistant engineer were required:—producing the following aggregate of daily expenses, viz.—

Actual Expenses.		
One ton of anthracite Coal, - -	$ 8	
Engineer, assistant and laborer, - -	3 50	
Expense of oil and packing, - - -	50	$12 00
Estimated Expenses.		
Repairs and wear of engine, and interest of its cost, - - - - - -	$ 3	
Expenses of Water stations, - - -	1 =	4 00
Total expense of the engine per day,	=	$16 00

This Engine, in its daily routine, accomplished the same exent of work that, with animal power, is now performed at the ollowing expense, viz.—

42 Horses, including their keep, interest on ost, their annual depreciation, harness and hoeing, at 50 cents per day, - -	$ 21	
Car drivers and stable keepers, = 12 *a* $1	12	
Total expense of animal power per day,	=	$ 33 00

The above statements of the comparative expense of steam and animal power, results in this single instance, in a saving of $17 per day, or of upwards of $500 per month.

It has been shewn that the Atlantic was employed in the traction of 5 cars, weighing about 18 tons, as an average speed of about 12 miles per hour. This performance has not been stated as the extent of the power of that engine, it was the speed and labor assigned to it as being the limit of that description of business which the Company required to be performed—On several occasions, much greater results were exhibited—thus a load of 30 tons, exclusive of the engine and tender, has been repeatedly drawn from Baltimore to Ellicotts' Mills, a distance of 1 miles, within an hour—the road for 5 miles ascending from 1 to 21 feet.

The Atlantic having been constructed with reference to speed of course, a portion of its power was merged in its velocit Messrs. Davis and Gartner, to whose skill and perseverance th Company are indebted for this first successful exhibition of stea power on their road, are, however, now engaged in the completi of another Engine, formed exclusively with reference to its for of traction. This Engine is expected to convey 100 tons fro 6 to 8 miles an hour.

Independent of the established superiority of steam powe it possesses an important advantage in accommodating its more readily to the fluctuations in the amount of business whi must daily occur on a rail road, designed, as this is, for a gener commerce. With an animal moving power, the inconvenienc of these fluctuations can neither be remedied nor mitigated, pr ducing, if an excess of business be offered, the disadvantage the public of unavoidable delay; and, in the event of a diminis ed traffic, the loss to the Company of frequently maintaining unemployed force, of which the expense cannot in any deg be reduced. By the substitution of steam for animal power, t first inconvenience can be materially lessened, by occasiona increasing the work of the Engines;—and, in the case of a ficiency of traffic, the expenses of the locomotives can imme ately be diminished, by suspending the operations of the surp s Engines;—when the principal costs—the fuel, the wear and pairs,—will be altogether saved.

From the tabular returns, accompanying this Report, it s been seen that the receipts for the last six months have b n $91,000. The sources of this income, it may be assumed, e permanent, as they are founded on the growing connexio f this work, with the general travelling and commerce of e country; and being derived solely from the superior facili s that this road presents, it is not probable that any portion o ts traffic will be either diminished or withdrawn. Such being the basis of its revenue, the same amount, it may be presumed, will, at least be maintained, throughout the residue of the year, being equal to an annual sum of $182,000. Such may, therefore, from the data adverted to, be considered as the actual progress made by this Company, to the present time, in the acquisition of a permanent revenue.

Besides the portion of the general transportation of the country which has thus been obtained, it has been previously remarked, that there is a large amount of tonnage, forming within itself a trade of considerable magnitude, which, although passing near to this road, has not, hitherto, been transferred to it;—for this, also, from the influence of the same considerations that have secured its present transportation, the rail road can scarcely fail to be ultimately found the most commodious means of conveyance.

In reference, therefore, to the question which must constantly recur, of the extent of the returns which this work may be capable of yielding, it is satisfactory to know that, even confined within its present limits, this road traverses a country which affords extensive resources of Transportation, and that from the actual revenue of the Company, aided by a portion of the Tonnage just adverted to, it would be enabled to make returns to the Stockholders, amply adequate to its cost.

Respectfully submitted,

W. WOODVILLE,
Auditor and Sup'dt of Transportation
Balt. and Ohio Rail Road Co.

(M. No. 1.)

STATEMENT of the Revenue received for the transportation of Passengers on the Baltimore and Ohio Rail Road, from the undermentioned places, respectively, from the 1st of October, 1831, to the 30th September, 1832—viz:

REVENUE FROM PASSENGERS.

During the month of	Baltimore.			Relay House.			Ellicotts' Mills.			Frederick.			Point of Rocks.			Total.		
	Passengers.	Amount.		Passengers.	Amount.		Passengers.	Amount.		Passengers.	Amount.		Passengers.	Amount.		Passengers.	Amount.	
October,	4517	$ 1378	19	1275	$ 338	75	2422	$ 933	91		$			$		8214	$ 2650	85
November,	3687	1554	09	841	223	48	2014	804	97	842*	856	23				7384	3438	77
December,	2068	2117	36	349	43	—	807	226	98	952	1109	69				4176	3497	03
January,	1533	1572	33	143	70	—	238	219	37	573	1012	21				2487	2873	91
February,	1647	1812	24	160	70	62	246	232	13	681	1223	38				2734	3338	37
March,	2738	2885	99	275	82	72	827	355	50	1210	1975	76				5050	5299	97
April,	3808	3771	04	651	174	12	1178	503	51	1696	2473	53	151	127	53	7484	7049	73
May,	4858	4160	21	728	193	67	1720	732	38	2928	5066	20	90	87	79	10324	8240	25
June,	5985	4559	68	734	169	59	2188	914	21	2785	2785	54	212	232	27	11904	8661	29
July,	5943	4558	47	693	183	94	2357	1044	98	2591	2539	78	323	287	02	11907	8614	39
August,	5157	4575	67	639	170	15	1760	841	30	2645	2757	42	380	346	69	10581	8691	23
September,	3502	2891	89	468	122	89	1074	494	85	1523	1780	68	210	264	22	6777	† 5554	53
Totals.	45443	35837	16	6956	1842	93	16831	7304	09	18426	21580	42	1366	1315	72	89022	67910	32

* These passengers were received at the foot of the Planes,—the Rail Road not having been then opened to Frederick, it has been deemed proper to put them under the head of passengers from Frederick.

September, in Baltimore.

(M. No. 2.)

STATEMENT of the Revenue received for the Transportation of Tonnage on the Baltimore and Ohio Rail Road, from the 1st of October, 1831, to the 30th September, 1832.

During the month of	Westwardly.			Eastwardly.			Total.		
	Tonnage.	Amount.		Tonnage.	Amount.		Tonnage.	Amount.	
October,	291.0.3.18	$ 317	92	693.9.1.27	$ 479	73	984.10.1.17	$ 797	65
November,	403.6.2.00	491	32	824.5.3.14	675	05	1227.12.1.14	1166	37
December,	355.10.3.09	548	55	2677.15.3.3	1716	17	3033.6.2.12	2264	72
January,	399.11.1.17	485	35	2881.0.0.19	4509	67	3280.11.2.08	4995	02
February,	718.15.0.5	1,078	41	4022.17.1.25	6127	37	4741.12.2.02	7205	78
March,	1021.19.2.26	2,093	75	3670.4.0.7	6312	83	4692.3.3.05	8406	58
April,	1559.1.1.4	3,535	83	2587.13.3.23	4413	21	4146.15.0.27	7949	04
May,	1393.0.1.8	3,531	13	2599.6.1.19	4712	01	3992.6.2.27	8243	14
June,	1005.17.0.12	2,098	73	2392.5.2.27	3788	63	3398.2.3.11	5887	36
July,	958.7.1.19	2,173	23	1825.19.1.16	3220	44	2784.6.3.07	5393	67
August,	1659.17.0.1	4,085	—	1997.7.3.7	3292	23	3657.4.3.08	7377	23
September,	1873.16.2.14	4,243	25	3273.12.2.2	5097	57	5147.9.0.16	9340	82
Totals,	11,640.4.0.21	$ 24,682	47	29,445.18.2.21	$ 44,344	91	41,086.2.3.14	$ 69,027	38

(M. No. 3.)

Statement of the aggregate Revenue, received on the Baltimore and hio Rail Road, from the 1st October, 1831, to the 30th September, 1832,

During the month of	From Passengers.			From Tonnage.			T[illegible]l.	
	Pas'gers.	Amount.		Tons, cwt. qr. lb.	Amount.			
October,	8,214	$2,650	85	984.10.1.17	7,97	65	3,4[illegible]	50
November,	7,384	3,438	77	1,247.12.1.14	1,166	37	4,[illegible]	14
December,	4,176	3,497	03	3,033. 6.2.12	2,264	72	5,[illegible]	75
January,	2,487	2,873	91	3,280.11.2. 8	4,995	02	7,[illegible]	93
February,	2,734	3,338	37	4,741.12 2. 2	7,205	78	10,[illegible]	15
March,	5,050	5,299	97	4,692. 3.3. 5	8,406	58	13,[illegible]	55
April,	7,484	7,049	73	4,146.15.0.27	7,949	04	14,[illegible]	77
May,	10,324	8,240	25	3,992. 6.2.27	8,243	14	16,3[illegible]	39
June,	11,904	8,661	29	3,398. 2.3.11	5,887	66	14,8[illegible]	65
July,	11,907	8,614	39	2,784. 6.3. 7	5,394	37	14,8[illegible]	06
August,	10,581	8,691	23	3,657. 4.3. 8	7,377	23	16,8[illegible]	46
September,	6,777	5,554	53	5,147. 9.0.16	9,340	82	14,5[illegible]	3[illegible]
Total,	89,022	$67,910	32	41,086.2.3.14	69,027	38	136[illegible]	[illegible]

RECAPITULATION.

Transportation.	Revenue.	
89,022 passengers.	$ 67,910	32
41,086.2.3.14 tons.	69,027	38
Total,	$136,937	70

[M. No. 4.]

A detailed statement of the expenses of Transportation from the 1st October, 1831, to the 30th September, 1832, viz:

During the month of	Moving power.		Agents and conductors.		Depot expenses.		Contingencies.		Total.	
October, 1831.	$1,364	07	$ 235	92	$ 119	58	$ 15	—	$1,734	57
November.	1,817	12	248	34	140	82	18	04	2,224	32
December.	3,462	—	1,012	50	296	87	44	—	4,815	37
January, 1832	4,775	01	1,371	74	870	56	205	37	7,222	68
February.	5,258	88	1,373	48	589	27	315	42	7,537	05
March.	5,274	51	1,371	74	542	45	525	64	7,714	34
April.	4,550	88	1,273	20	408	06	320	04	6,552	18
May.	4,208	49	1,300	74	459	69	374	57	6,343	49
June.	4,297	05	1,277	50	385	—	85	—	6,014	55
July.	4,368	58	1,219	68	331	88	177	80	6,097	94
August.	4,523	40	1,191	33	393	33	379	36	6,487	47
September.	4,629	52	1,146	49	469	49	515	10	6,760	51
	48,529	51	13,022	66	5.006	96	2,975	34	$69,534	47

[M. No. 5.]

A detailed statement of the Receipts, Expenses and net Revenue of Transportation on the Baltimore and Ohio Rail Road from the 1st October, 1831, to the 30th September, 1832.

During the month of	PASSENGERS.						TONNAGE.						TOTAL.					
	Receipts.		Expenses.		Net Revenue.		Receipts.		Expenses.		Net Revenue.		Receipts.		Expenses.		Net Revenue.	
October, 1831.	$2,650	85	$1,449	07	$1,201	78	$ 797	65	$ 285	50	$ 512	15	$3,448	50	$1,734	57	$1,713	93
November,	3,438	77	1,628	32	1,810	45	1,166	37	595	—	570	37	4,605	14	2,224	32	2,380	82
December,	3,497	03	2,715	75	781	28	2,264	72	2,099	62	165	10	5,761	75	4,815	37	946	38
January, 1832.	2,873	91	2,743	64	130	27	4,995	02	4,479	04	515	98	7,868	93	7,222	68	646	25
February,	3,338	37	2,603	19	737	18	7,205	78	4,933	86	2,271	92	10,544	15	7,537	05	3,007	10
March,	5,299	97	2,708	54	2,591	43	8,406	58	5,005	80	3,400	78	13,706	55	7,714	34	5,992	21
April,	7,049	73	2,885	32	4,164	41	7,949	04	3,666	86	4,282	18	14,998	77	6,552	18	8,456	59
May,	8,240	25	2,949	00	5,291	25	8,243	14	3,394	49	4,848	65	16,483	39	6,343	49	10,139	90
June,	8,661	29	3,019	00	5,642	29	5,887	36	3,025	55	2,861	81	14,548	65	6,014	55	8,504	10
July,	8,614	39	3,035	55	5,578	84	5.393	67	3,062	39	2,331	28	14,008	06	6,097	94	7,900	12
August,	8,691	23	3,054	08	5,637	15	7,377	23	3,433	39	3,943	84	16,068	16	6,487	17	9,580	99
September.	5,554	53	3,061	32	2,486	21	9,340	82	3,692	19	5,648	63	14,895	35	6,760	51	8,134	84
Totals,	$67,910	32	$31,859	78	$36,050	54	$69,027	38	$37,674	69	$31,352	69	$136,937	70	$69,534	47	$67,403	23

Total amount of revenue brought down, - - - - - - -			$136,937.70
Ditto expenses, - - - - - - - - -		69,534.47	
In addition to the above there are the following charges for repairs, viz:			
By the Superintendent of Construction, for repairs of the Railroad,	2,067.97		
By the Superintendent of Machinery, for repairs of carriages and machinery,	4,071.99	6,139.96	75,674.43
Net Revenue,			$61,263.27

(M. No. 6.)

A detailed **Statement** of the Receipts, Expenses, and Net Revenue of Transportation, on the Baltimore and Ohio Rail Road, from the 1st of April to the 30th September, 1832.

	PASSENGERS.						TONNAGE.						TONNAGE.					
	Receipts.		Expenses.		Net Revenue.		Receipts.		Expenses.		Net Revenue.		Receipts.		Expenses.		Net Revenue.	
April,	7,049	73	2,885	32	4,164	41	7,949	04	3,666	86	4,282	18	14,998	77	6,552	18	8,456	59
May,	8,240	25	2,949	—	5,291	25	8,243	14	3,394	49	4,848	65	16,483	39	6,343	49	10,139	90
June,	8,661	29	3,019	—	5,642	29	5,887	36	3,025	55	2,861	81	14,548	65	6,044	55	8,504	10
July,	8,614	39	3,035	55	5,578	84	5,393	67	3,062	39	2,331	28	14,008	06	6,097	94	7,900	12
August,	8,691	23	3,054	08	5,637	15	7,377	23	3,433	39	3,943	84	16,068	46	6,487	47	9,580	99
September,	5,554	53	3,068	32	2,486	21	9,340	82	3,692	19	5,648	63	14,895	35	6,760	51	8,134	84
Totals,	46,811	42	18,011	27	28,800	15	44,191	26	20,274	87	23,916	39	91,002	68	38,286	14	52,716	54

(M. No. 7.)

Abstract of Tonnage, transported Eastwardly on the Baltimore and Ohio Rail Road, from the 1st October, 1831, to the 30th September, 1832, inclusive.

Months.	Flour.		Tobacco.		Grain	Meal and Ground Stuffs.	Pork & Bacon.	Fire Wood.	Granite.	Paving Stone.	Red Ochre	Soap Stone.	Lime.	Iron Weight.	Iron Ore.	Hardware.	Leather.	Ship Timber and Lumber.	Whiskey.	Flax Seed	Bark	Cotton Goods.	Paper.	Miscellaneous.	Total.
	Bll's	Weight.	Hhd's	Weight.																					
1831.		Tons.		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
October,	378	36. 9. 0. 0	4	2. 0. 0. 0	1.18. 1. 3	1. 0. 0. 0	- - - -	60. 0. 0. 0	97.10. - -	415. 0. 0. 0	17.10. 0. 0	- - -	- - -	60.16. 1.24	- - -	- -	- - -	- - -	- - -	- - -	- - -	- - -	1. 5. 3. 0	693. 9. 1.27
November,	1,368	131. 0. 1.20		" " " "	5. 0. 0. 0	4. 0. 0. 0	- - - -	- - - -	235.15. - -	322.10 0 0	- - - -	7.10. 0. 0	- - -	110. 3. 3.13	- - -	- - -	1. 0. 0. 0	5. 0. 0. 0	- - -	- - -	- - -	- - -	- - -	2. 6. 2. 9	824. 5. 3.14
December,	3,768	363. 6. 3.12	3	2. 2. 2. 0	" 10. 0. 0	25 8. 0. 0	4 17. 3.27	1,762. 1. 0. 0	283. 7. - -	45. 0. 0. 0	- - - -	- - - -	- - -	148. 7. 1.14	- - -	- - -	- - - -	8. 3. 0. 0	11.10. 0 0	- - -	- - -	- - -	- - -	23. 2. 0. 6	2,677.15. 3. 3
Jan. 1832.	15,067	1,452.17. 3 4		" " " "	41. 7. 2. 0	31. 1. 1.10	8. 5. 0. 5	1,026.11. 2. 0	200. 4. - -	- - - -	- - - -	11.14. 0. 0	- - -	67.13. 1.25	- - -	- - -	0.14. 0.16	9. 4. 0 0	14. 9. 2.24	0. 3. 3.25	9.11. 0. 0	- - -	- - -	7. 2. 2.22	2,881. " "19
February,	21,801½	2,102. 4. 3.12	4	1.11 0. 0	20. 4. 3. 5	37.11. 3.22	- - - -	1,033.18. 2.27	519 11. - -	- - - -	- - - -	6. 3. 0. 0	- - -	192.15 3.21	- - -	1.11. 0. 0	51.16. 0 5	10. 0. 0. 0	22.15. 0.20	- - - -	" " " "	- - -	- - -	2 10. 3.25	4,022.17. 1.25
March,	20,999	2,024 18. 0. 8	14	5.13. 2. 0	13 3. 3.13	31. 0. 1.17	- - - -	229 12. 0. 0	981.10. 0. 12	191. 2. 0. 0	- - - -	10. 2. 0. 0	2. 1. 2. 2	112. 7. 2. 0	- - -	4. 6. 2. 0	10.18. 1. 8	23. 0. 0. 0	14. 1. 2. 0	- - - -	2.16. 0. 0	- - -	- - -	10.10. 3. 3	3,670. 4. 7
April,	12,418½	1,197. 9. 3.21	13	16.10. 3. 0	21.15. 2.19	24.18. 3. 0	- - - -	4.13. 0. 0	747. 8. 2. 16	256. 1. 3. 0	37. 7. 3. 0	- - - -	78. 1. 3. 8	130.18. 0.16	- - -	0.15. 1. 0	10. 8. 0.24	11.13. 0. 0	2.10 1.12	- - - -	5. 4. 0. 0	0. 7. 0.11	- - -	41. 9. 3. 5	2,587.13. 3.23
May,	13,052	1,257.14. 1.12	162	61. 8. 2. 0	48. 7. 1.16	38. 8. 2. 6	0. 4. 0. 0	- - - -	423 16. - 18	219.12. 2. 9	41. 7. 1. 0	11. 1. 0. 0	222.12. 3. 8	171. 3. 1.27	- - -	18. 7. 1.14	6.13. 3.12	25.10. 0.13	0. 3. 0. 0	0. 1. 1. 4	" " " "	22. 1. 3. 8	2. 4. 0. 0	28. 8. 3.12	2,599. 6. 1.19
June,	8,218½	792. 9. 3.21	58	23. 0. 2.13	87.16. 0.11	71. 2. 0.19	- - -	- - - -	731. 7. 2. 13	94.18. 0. 0	69. 5. 0. 0	13.13. 0. 0	253 16. 2. 0	129. 5. 3.20	- - -	33. 4. 0.21	7. 6. 2.20	10. 0. 0. 0	- - - -	- - - -	36.10. 2. 0	20. 4. 3 0	1.10. 0. 0	16.14. 2.26	2,392. 5. 2.27
July,	7,584½	731. 7. 1.20	52	19.16. 0. 0	38.17. 3. 3	51. 7. 0.19	- - - -	- - - -	401. 6. 2. 10	6. 2. 3. 0	6. 6. 2. 0	4.16. 0. 0	189. 4. 1. 0	241.10. 2. 9	24. 9. 3. 0	- - - -	5.18. 2.18	58.15. 0. 0	0.14. 2. 0	- - - -	9.11. 2. 0	17.12. 3. 0	1.10. 0. 0	17.12. 0.21	1,825.19. 1.16
August,	11,247	1,061. 2. 0. 8	33	13. 8. 0. 0	46.17. 3.14	70. 3. 1. 8	- - - -	5 17. 1. 0	303.16. 3. 10	- - - -	- - - -	- - - -	199.10. 0. 0	122. 8. 1.24	- - - -	25.11. 3.20	7. 6. 2. 7	59.18. 1. 0	- - - -	- - - -	5.16. 2. 0	21.17. 0. 0	4. 3. 0. 0	51.10. 2.24	1,997. 7. 3. 7
September,	15,034	1,459.14. 0 16	72	28.12. 2. 0	27. 0. 0.13	122.14. 1.15	15. 6. 1.17	343.17. 3. 0	586.11. 2 -	- - - -	- - - -	5.12. 0. 0	254 5. 1. 0	86. 3. 0. 0	40.12. 2. 0	47. 2. 2.10	9. 1. 3. 2	162. 4. 0. 0	- - - -	0.13. 1. 0	4.16. 0. 0	17. 1. 0. 0	3. 5. 2. 0	58.18. 3.13	3,273.12. 2. 2
	130,936	12,610.14.3 20	445	174. 6. 1.13	352.19. 1.13	511.16. 0. 4	28.13. 1.21	4,486.11. 0.27	5512. 4. 1. 23	1,549. 7. 0. 9	171.16. 2. 0	70.11. 0. 0	1,199.12. 0.18	1,573.14. 0.25	65. 2. 1. 0	130.15. 3.13	111. 4. 1. 0	383. 7. 1.13	66. 4. 1. 0	0.18. 2. 1	74. 5. 2. 0	99. 4. 1.19	10.12. 2. 0	261.13 3. 26	29,445.18. 2. 21

RECAPITULATION.

Commodities.	*Weight.* Tons Cwt. qr. lbs.
Flour 130,936 barrels,	12,610.14. 3. 20
Tobacco,	174. 6. 1. 13
Grain,	352.19. 1. 13
Meal and Ground Stuff.	511.16. - 4
Pork and Bacon,	28.13. 1. 21
Fire Wood,	4,480.11. " 27
Granite,	5,512. 4. 1. 23
Paving Stones,	1,549. 7. " 9
Red Ochre,	171.16. 2. "
Soap Stone,	70.11. " "
Lime,	1,199.12. " 18
Iron,	1,573.14. " 25
Iron Ore,	65. 2. 1 "
Hardware,	130.18. 3. 13
Leather,	111. 4. 1. "
Ship Timber, and Lumber,	383. 7. 1. 13
Whiskey,	66. 4. 1. "
Flaxseed,	" 18. 2. 1
Bark,	74. 5. 2. "
Cotton Goods,	99. 4. 1. 9
Paper,	10.12. 2. "
Miscellaneous,	261.13. 3. 26
Total,	29,445.18 2. 21

OFFICE OF THE TREASURER OF THE
Baltimore and Ohio Rail Road Co.
1st October, 1832.

TO PHILIP E. THOMAS, ESQ.
President of the Baltimore and Ohio Rail Road Co.

Dear Sir—I herewith transmit to you the following statements in relation to the fiscal operations of the Baltimore and Ohio Rail Road Company, and also a list of its real estate, to wit:

1. An exhibit of the entire disbursements of the company from its first organization to the present time, marked N. No. 1.
2. A statement of the receipts from transportation and of the amount of dividends paid, marked N. No. 2.
3. An account-current, embracing all the receipts and expenditures of the company, marked N. No. 3.
4. A list and description of the real estate now held by the Baltimore and Ohio Rail Road Company, marked N. No. 4.

I am, very respectfully, &c.

GEORGE BROWN,
Treasurer of B. & O. R. R. Co.

[N. No. 1.]

An exhibit of the entire disbursements of the company from its first organization to the present time:

Expenses incurred in obtaining the charter, and in the organization of the company, and expenses of various committees since, - - -		$ 5,446.28
Mission to England, and salaries of the board of engineers, - -		21,160.95
Salary of the Chief Engineer, since the new organization of the officers,		5,250.00
Office expenses, including stationary, postages, printing, advertising, &c. - - - - - -		10,346.44
Surveys for the lateral branch road to Washington, - - - -	$ 16,650.00	
Interest, - - - - -	38,390.85	
Law expenses, fees of counsel and chancery expenses, - - -	24,158.94	

Preliminary surveys of the various routes previous to the location of the road, including instruments, estimated at - - - - - - -	24,000.00	
		103,199.79
Expenses of final surveys and location, including instruments, -		16,648.26
Construction of a bridge for the accommodation of the Washington road over the railway, - - -		3,534.98
Expenditures by department of graduation and masonry,	1,193,744.79	
Expenditures by department of construction, including materials to the value of about $36,000 remaining on hand, - - - - - -	822,055.14	
Expenditures by other departments on account of graduation and masonry, and expenses incurred in obtaining right of way for road bed, damages paid to landholders, salaries to other officers than engineers, and including small unexpended balances now remaining in the hands of the disbursing officers, - - - -	56,363.89	
		2,072,163.82
Contingencies, - - - -		1,525.97
Expenditures on account of movingpower; including carriages, wagons, steam engines, horses, &c. -	184,634.22	
Construction of depots, including purchase of property, building stables, &c: - - - - - -	83,445.87	268,080.09
		$2,507,356.5

Note. Of the above expenditures, it will be perceived that the sum o $268,080 09 has been disbursed in the acquisition and improvement of rea property and in the procurement of machinery and moving power, beside $16,650 paid on account of surveys for the Washington Rail Road, $24,00 paid for preliminary surveys required over a great district of country for th ascertainment of the best practicable route for the final location of the roac $38,390.85 paid for interest on loans obtained in anticipation of the insta ments, and $24,158.94 paid for law expenses, leaving the sum of $2,136,076.7 for the construction of the road and all the various expenses incident to th organization and operations of the company up to this period. At the sam time, it may be remarked, that the real estate, machinery and moving pov er, owned by the company is now fully worth the cost at which it stanc charged.

[N. No. 2.]

Statement of the receipts from Transportation and of the amount of dividends paid.

Amount received from the Transportation of passengers and tonnage, up to the 1st October, 1832. - - -		$183.053.21
Amount paid for dividends declared,	$69,075.00	
Expenses of Transportation,	98,653.01	167,728.01
Balance on hand in favor of Transportation account,		$15,325.20

[N. No. 3.]

The Baltimore and Ohio Rail Road Company,
In account with George Brown, Treasurer, Cr.

By cash received on 39,900 shares, upon which $55 per share has been paid, - - -	$2,194.500	
Cash received, on 100 shares paid up in full $100 per share,	10.000	
Cash received, on loan from the Bank of the United States,	200.000	
Cash received, on loan from the Mechanic's Bank of Baltimore,	100.000	
Balance on hand from Transportation account, - - -	15.325.20	
		$2,519,825.20
To amount of disbursements from the organization of the company to the 1st October, 1832, per Statement, N. No. 1.	$2.507,356.58	
Balance at the Cr. of the Company,	12,468.62	
		$2,519,825.20

Baltimore, October 1*st*, 1832,

GEORGE BROWN, *Treasurer,*
Of the Baltimore and Ohio Rail Road Company.

[N. No. 4.]

List, and description, of the real estate acquired, and now held by the Baltimore and Ohio Rail Road Company.

1. Two entire squares of ground, containing nearly three acres and a half, situated at the eastern termination of the rail road on the City Block, bounded by Exeter, Lancaster, Fleet and Canal streets, and divided by Alice Anna street; fronting on these several streets two thousand two hundred and twelve feet, of which front, two hundred and fifty-seven feet lies on the city dock, affording a direct communication between the railway and

the shipping in the harbour. This property was a donation to the company from the corporation of the city of Baltimore, and was conveyed by deed, bearing date the 22d day of June, 1832, recorded in Baltimore county.

2. Three parcels or lots of ground situated on Pratt and Charles streets, in the city of Baltimore, near to Light street wharf; conveyed by John White, trustee, and William Patterson, by deed bearing date the 29th day of July, 1831, recorded in Baltimore county.

3. Four undivided fifth parts of a lot of ground on Pratt street, and of a lot adjoining thereto, conveyed by William Gwynn and others, trustees, by deed bearing date the 6th day of July, 1831, recorded in Baltimore county.

4. A lot of ground at the intersection of Charles and Camden streets, adjoining the last mentioned lots, assigned by Robert Miller, by indenture bearing date the 6th day of June, 1831, recorded in Baltimore county.

N. B. On the above described pieces of ground situated between Light, Pratt, Charles and Camden streets, there are erected six commodious warehouses, now partly occupied as the principal depot of the company, in the city of Baltimore.

5. A lot of ground containing nearly ten acres of land, situated near the intersection of Pratt street and the Washington turnpike road, bounded on three of its outlines by James, Stockholm and Republican streets, being now used as a depot, and is the point at which the locomotive engines of the company arrive and depart. There is erected upon this lot, an extensive house for the protection of the carriages, a weighing house, offices for the forwarding agents of the company, work shops, and other conveniences and fixtures. This property was a donation to the company, from James Carroll, Esq., and was conveyed by deed, bearing date the 1st day of December, 1830, recorded in Baltimore county.

6. A lot of land situated on the tenth section of the first division of the rail road immediately at its intersection with the Washington turnpike road, about six miles from Baltimore, conveyed by Joshua and Harriet Trimble, by deed, bearing date the 11th day of June, 1830, recorded in Baltimore county.

7. A lot of ground situated at the first intersection of the rail road with the Frederick turnpike road at Ellicotts' Mills, binding on that turnpike two hundred and twenty-nine feet, and containing about one acre of land, upon which is erected a substantial and appropriate warehouse and necessary offices for the accommodation of the trade at that depot.

This property was a donation from George, Samuel, Andrew and John Ellicott, and was conveyed by deed bearing date the 2d day of December, 1830, recorded in Anne Arundel County.

8. A parcel of land containing about five and one-third acres at the commencement of inclined plane number one, extending

one hundred and fifty feet on each side of the centre of the rail road, and running parallel therewith seven hundred and sixty-eight feet. This land is intended for additional rail tracks, turnouts, and buildings necessary at the foot of that plane. The title was acquired by the inquisition of a jury, whose verdict is recorded in Baltimore county.

9. A parcel of land containing about two and a half acres, extending three hundred and fifty-eight feet in length by three hundred feet in width, at the head of plane number one. This ground is intended for the accommodation of a stationary engine and other fixtures. The title to it, was acquired in the same manner as to the preceding lot, and the verdict is lodged for record in Baltimore county.

N. B. Objections have been filed to the ratification of the last mentioned verdict, which are now *sub judice.*

10. A tract of land containing eight and a half acres, on the summit of Parr's Ridge, extending one hundred and eighty-three feet on each side of the centre of the rail road for a distance along and parallel therewith seven hundred and eighty-seven feet, and thence continuing on the south side thereof only, the further distance of one thousand feet. The title to this land was acquired in the same manner as the two preceding tracts, and the verdict is recorded in Frederick county.

This piece of land is intended for the accommodation of the stationary engines and their necessary appendages to be erected at that place, for working of planes number two and three. The extension of the line one thousand feet on the south side further than on the north side of the road, was for the purpose of securing a spring required to afford the necessary supply of water for the engines.

11. A tract of land at the head of incline plane number four, containing between seven and eight acres, intended for the accommodation of a stationary engine. This tract is, in length, nine hundred feet, and in width one hundred and fifty feet, on each side of the centre of the rail road, excepting for a short distance on the south side, where the width was enlarged to take in a spring necessary to afford a supply of water for the engines.—The title was acquired in the same manner as the preceding, and the verdict is recorded in Frederick county.

12. A tract of five and a half acres at the foot of inclined plane number four, extending in length eight hundred feet, and one hundred and fifty feet in width, on each side of the centre of the road. This land is intended for similar purposes, as that owned by the company, at the foot of incline plane number one. The title was acquired in the same manner, and the verdict is recorded in Frederick county.

13. A lot of ground containing six acres, situated in the city of Frederick, upon which, the company are now erecting a substantial and commodious warehouse and offices for the accom-

modation of the depot established at that place, as also the requisite car houses and other convenient fixtures. This property was a donation from the city of Frederick, and was conveyed by a deed executed by Lewis Birely, Esq., dated the 30th day of May 1831, recorded in Frederick county.

Respectfully submitted,

G. BROWN, *Treasurer,*
Balt. & Ohio Rail Road Company.

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First Nine Miles of the
RAIL ROAD
from Balt° to W

SEVENTH

ANNUAL REPORT

OF THE

PRESIDENT AND DIRECTORS

TO THE

STOCKHOLDERS

OF THE

BALTIMORE AND OHIO

RAIL ROAD COMPANY.

BALTIMORE:
PRINTED BY WILLIAM WOODDY,
No. 6, S. Calvert Street.
1833.

SEVENTH ANNUAL REPORT.

IN presenting to the Stockholders of the Baltimore and Ohio Rail Road Company, their Seventh Annual Report, the Board of Directors deem it proper to refer to the situation of the Company's affairs at the date of their last communication. On the 1st of October, 1832, when that communication was made, the main stem of the road had been completed, with two tracks, as far as the Monocacy river, and with a single track to the Point of Rocks on the Potomac; a lateral road, with a single track, had also been finished from the Monocacy to the City of Frederick. Between the last named place and Baltimore, there had been, with but few interruptions, a transportation of persons and merchandize, from the 1st of December, 1831; and from the Point of Rocks to Baltimore, the transportation had commenced on the first of April, 1832. The experience which the construction and use of the road had afforded, when the Sixth Annual Report was made, justified the Board of Directors in assuring the Stockholders of their entire confidence in the final success of the work. The practicability of applying steam power profitably, for the purposes of general transportation, had been satisfactorily ascertained· the efficiency of the rail road system, in the particular district of country, had been put beyond all doubt; and new sources of revenue to the Company, not contemplated by the original projectors, had been fully developed, as the adjacent quarries were opened, and the forests felled, and the rail road was employed in the transportation of their respective products. Under these circumstances, there was evident cause for congratulation upon the results that had so far been obtained: but the Board saw that much was still to be done, before those pecuniary advantages could be realized to the Stockholders, that had originally been anticipated, and the postponement of which, had, even now, begun to create feelings of disappointment in the minds of many of the friends of the scheme.

Three objects, in particular, called for the immediate attention of the Board of Directors at the commencement of the official year, that has just ended. 1. The extension of the Rail Road to Harper's Ferry. 2. The construction of the lateral Rail Road to Washington—and 3. The perfection of the application of steam power for the purposes of transportation, together with the subject of machinery generally. All of these, it was considered, were most closely connected with the pecuniary interests of the Stockholders, and the detail of what has been accomplished in regard to them, will occupy the largest portion of the present report.

1. *The Extension of the Rail Road to Harper's Ferry.*

The Stockholders are already familiar with the particulars and result of the long pending controversy between the Rail Road and the Chesapeake and Ohio Canal Companies, for the right of way upon the left Bank of the Potomac. The decision of the Courts, in favour of the latter corporation, was followed by tedious negotiations, which partook, at first, perhaps, of the feelings that had grown up during the legal proceedings, and which brought the parties again into collision before the Legislature of Maryland, their common parent. Time, however, and a better and more correct view of their true interests than had before been taken, led ultimately to a compromise, by which the Canal Company undertook, upon the payment by the Rail Road Company, of the sum of $266,000, in monthly payments, to construct the Rail Road along all the difficult passes between the Point of Rocks and Harper's Ferry. The payments and the construction have both been commenced by the respective parties; the whole length of the road between the two places, has been advantageously located; and there is every reason to believe, should no unfavourable circumstance arise to retard the work, that, by the first day of January, 1835, it will be completed to Harper's Ferry. The arrangement thus made, was one which, under all circumstances, was unobjectionable: and it is with gratification that the Board are enabled to inform the Stockholders, that they feel confident the conditions of the agreement will be carried into effect by the Canal Company with a liberal and friendly disposition to render every accommodation to the Rail road that may be found compatible with the interests of their own work. [See appendix Document A.] The Canal Company were, at the time of the compromise, the exclusive possessors of the only practicable site for a rail road at the narrow passes, with a title obtained after protracted litigation, and with power to demand their own terms: but in those which have been acceded to, the Board do not perceive that more will be paid than sufficient fully to cover, as was intended, the cost of constructing those portions of the Rail Road which the Canal Company have undertaken to do, and the loss and damages to which the Canal must, while such construction is going on, necessarily be subject; certainly not more than the Rail Road Company must have paid, had they undertaken the independent construction of the road at the same places. To the Rail Road Company, the advantages to be expected on reaching Harper's Ferry, were such as to render the continuation of the Road to that place a matter of primary importance, demanding every effort to accomplish it. The Winchester and Potomac Rail Road, about thirty miles in length, and terminating at Harper's Ferry, promised to transfer to the Baltimore and Ohio Rail Road, to be conveyed to Baltimore, a great share of the produce of the rich valley of Virginia, which then found an outlet in other directions. Winchester itself, a large, thriving, and enterprising town, would be brought into the closest connection with Baltimore, to the mutual advantage of both cities. Staunton, one hundred miles from Winchester, in the same great valley,—the intervening distance admirably adapted to the construction of a Rail Road,—would, in all probability, soon become another point in the line of rail way communication, under a charter already in existence—nor was it anticipating too much, to believe, that, thus progressing through individual enterprize, from point to point, the prolongation of the Baltimore and Ohio,and the Winchester and Potomac Rail Roads, would either continue south westwardly to the cotton growing districts of Tennessee, intersecting the proposed James River and Kenawha Rail Road, or, passing through Jennings' Gap, find its own way to the tributaries of the Ohio, completing, in either event, the great scheme of an union, by railways, of the waters of the Atlantic sea board with those which empty themselves through the Mississippi into the Gulf of Mexico. In the meanwhile, it was known, that Virginia was engaged in making an excellent road from Winchester, direct to Parkersburg, at the mouth of the Little Kenawha, on the Ohio, which, uniting with the Rail Road at Winchester, would turn the tide of Western travelling into that direction, and extensively attract to both the Baltimore and Ohio, and the Potomac and Winchester rail roads, the transportation of persons and merchandize, as well as produce, which then went in other channels. Besides the advantages thus held out by the valley of the Shenandoah, on the completion of the Rail Road to Harper's Ferry, it would be, at that place, in such close proximity to the Valley of the Conococheague, as to render a connection with the latter, and through it with some of the most fertile parts of Pennsylvania, a matter of easy attainment, by which a still farther amount of transportation would accrue to the road, with but small additional expense necessary to accommodate it, and which would increase, the profits of the Stockholders. In addition to which, the Rail Road company, at Harper's Ferry, would still be upon the line of Western communication, originally contemplated by the Valley of the Potomac, whenever circumstances made it expedient to advance in that direction. Nor, while a part of the advantages here enumerated were secured by the actual construction of the Potomac and Winchester Rail Road, and the turnpike to the Little Kenawha, were the rest of them either improbable or remote. While Rail Roads were extending tbemselves throughout the union, in every direction, through districts promising fewer advantages than the valleys of the Shenandoah and Conococheague, there could be but little doubt but that these last would speedily possess them. Under these circumstances, therefore, and with a view to ulterior objects, not less than to immediate pecuniary advantages, the Board felt that they were called upon to secure by every effort, the continuation of the road to Harper's Ferry—and in doing so, they believe that they have discharged one of the most important of the trusts committed to them.

2. *The Construction of the Lateral Road to Washington.*

At an early period in the existence of the Company, the expediency of a lateral Rail Road to Washington, in connection with the Baltimore and Ohio Rail Road, was suggested and universally admitted. Eight miles of the distance, or one fifth, and that certainly the most difficult of construction, had already been made in the prosecution of the main stem towards the Ohio, and a level obtained, at the crossing of the Patapsco, which would materially diminish the expense of passing the dividing ridge between the waters of that river and the Patuxent. The arrangements too, in the streets of the City of Baltimore, which were prepared for the accommodation of the main stem, would be equally available for the lateral road; and the experience already obtained by the officers of the Company, would secure the completion of the work upon the best terms, and in the cheapest manner. These reasons pointed to the Baltimore and Ohio Rail Road Company, as the proper body to construct the Rail Road to Washington, and the profit which it was conceded, on all sides, would result from the work, when completed, induced the Company to undertake it. Application was accordingly made to the Legislature, at December session, 1830, for pecuniary aid, by a subscription to the stock of the Baltimore and Ohio Rail Road Company. The subscription was not made, at the time, but the right to make it was reserved by the State. Although the law that was passed on the subject, was by no means acceptable, the Company continued the surveys for the road, and obtained an act of Congress authorising its construction within the district of Columbia. At the session of 1831, of the state Legislature, the application of the preceding year was renewed, and the law was modified in many important particulars, but still the option to subscribe to the stock was left to the State, and the uncertainty whether this would be exercised or not, made the law of 1831 but little more acceptable or efficient than that of 1830. The surveys, however, were still continued, the nature of the country between Baltimore and Washington, being found to be such as to require very extensive examination, and the most careful comparisons of the various practicable routes, previous to the adoption of any line between the two places. [See report of a Committee of the Board appendix, Document B. and the annual report of the Chief Engineer, appendix, Document D.]

At the last session of the Legislature, the application of the Company for assistance to construct the Washington road, was again made, and with a success that authorised the commencement of the work without further delay. The fare for carrying a person the whole distance between Baltimore and Wasington, was raised from $1.50, the price in the two preceding laws, to $2.50, subject to such reduction as expediency might require. The State took $500,000 of the stock, upon condition that $1,000,000 should be bona fide subscribed by others, andproviding that the whole $1,500,000 should be a separate stock; the Rail Road Company to pay to the State, as a bonus, one-fifth of its annual receipts from the conveyance of passengers, besides its proportion of dividends on the stock held by it. Authority was given to the Rail Road Company to subscribe to such portion of the stock, as might not be taken at the end of thirty days after opening the books, to borrow money to pay the instalments on their stock, and "to pledge the property and funds of the Baltimore and Ohio Rail Road Company, with the consent of a majority of the stockholders, in general meeting called for that purpose, and so much of the stock made a separate stock, as might be subscribed by the Baltimore and Ohio Rail Road Company, as a security for the payment of any and every sum so borrowed, and the interest thereon, provided that the property of the State in said road, should, in no event, constitute any part of the pledge above mentioned." Authority was also given to the City of Baltimore, and the Company owning the turnpike road between Washington and Baltimore, to subscribe for a certain amount, if they thought proper, at any time within six months after the passage of the law. The books being opened, stock to the amount of $61,200, was taken by individuals; but the City of Baltimore, and the Turnpike Company, not having subscribed, the question at once arose, whether the road should be abandoned, or the Baltimore and Ohio Rail Road Company should take the unsubscribed stock, under the authority granted to them by the act of assembly. To determine this, a meeting of the stockholders was called, upon the 8th day of May, 1833, at which it was determined, by a vote of 25,454 shares to 820 shares, to take the stock, and to make the pledge authorised by the law for the payment of the principal of the sums borrowed for the purpose, and the interest thereon. In consequence of this determination, the Board took immediate measures to commence the lateral road, and have effected such pecuniary arrangements with the Union Bank of Maryland, as will secure the successful prosecution of the design. The surveys have been completed, and after a most careful and minute examination of the various lines run, the Board have adopted a route as far as to the District of Columbia, presenting in no case, an elevation of more than 20 feet to the mile, or a curvature of a less radius than 1273 feet, the average radius being about one mile. The bridge over the Patapsco, at the Hockley mills, has been under contract since the beginning of July, and is rapidly progressing; the contractors have also commenced operations on the first division of the road, extending from this bridge to the summit of Merrill's ridge. [See the report of the Superintendent of graduation and masonry, appendix Document E.]

The remainder of the road will, in a short time, be let, and the graduation of the whole distance, will be prosecuted simultaneously, so as to be completed at the same time with the bridge over the Patapsco. The Board feel satisfaction in announcing to the Stockholders, that the proprietors of the land over which the road will pass, have, very generally, either ceded the right of way gratuitously, or agreed to refer the subject to amicable arbitrament, so that a pregnant source of expense and litigation, will, in a great degree, be avoided.

With the prospect of profit to the stockholders, on the completion of the lateral road, the board have every reason to be satisfied, from the two additional sources of revenue that will then be open. The one, the use of eight miles of the present road for a transportation, which it would otherwise never possess—the other, the dividends on the amount of stock held by the company, as an independent corporation, in the undertaking.

With regard to the resources of the company to meet the interest on the loans made for the lateral road, and the course which has been adopted in relation to it, the board refer to the report of a committee of their body, dated July 12th, heretofore published, and now inserted in the appendix. [See Document C.]

3. *The perfection of steam power for the purposes of transportation, together with the subject of machinery generally.*

In the Sixth Annual Report, the Board of Directors announced the satisfactory result of the improvements that had been made with the engine of Davis & Gartner, constructed with Cooper's vertical boiler—many further experiments however, were necessary, and much remained to be done, before the Board could feel themselves authorised to order engines upon this plan. The first engine was necessarily an experiment. The exact proportion of the parts could only be determined by constant use—and for sometime after the engine commenced running, frequent alterations were found to be necessary to obtain the strength, lightness and compactness, united with general efficiency, essential to the success of the machine. This however, has been finally accomplished, and the Board feel satisfied that they have obtained, by the perseverance of those in their employment, an engine better adapted to the purposes of this road, than any other yet invented. The engine in question is as manageable as the best English engines, possesses much more power with the same weight, works with equal, or very nearly equal, facility, on a curved and straight road, presents all its parts to the eye of the Engineer as he occupies his stand, burns the anthracite coal with great facility and powerful effect, and evaporates more water in a given time, and is liable to far less injury from wear and tear, than any other known engine. The objection against the English engine of the present construction, is, that the tubes of its horizontal boiler are frequently bursting, by which, not only is the expense of repairs incurred, but the bursting of a tube at once extinguishes the fire, leaving sometimes the engine and its train in the middle of their journey. In the vertical boiler used by this company, and the right to use which they have purchased from the ingenious inventor Peter Cooper, Esq. all this is entirely avoided. In the horizontal boiler, the fire is at one end, where of course the greatest quantity of steam is produced, and the density of the water is the least; so that the tubes, where most exposed to the action of the heat, are least protected from it; and the fact is, that the tubes commonly all burst within a few weeks. Various attempts have been made to remedy this by producing a circulation in the water of the boiler, but hitherto it is believed without success. In the vertical boiler, on the contrary, the water on the outside being colder than that which is near to the tubes, descends towards the fire and passes up again in bubbles of steam to the steam chamber, to exert its expansive power in pressing the water of the boiler downwards to the very place where the intense heat of the anthracite coal renders every protection necessary which can be afforded to the bottom of the boiler, and to the tubes. In the upright boiler, therefore, without the intervention of complicated machinery to obtain a circulation, it is produced in the most efficient manner, by simple and natural causes. Some idea may be formed of the value of the vertical boiler, adopted by the Board, from the fact, that, after twelve months use with *anthracite coal* for fuel, not one of the tubes of the Atlantic engine has given way, and to all appearance they are now as sound as when first put in. For a further account of the performances and power of this engine, see report of the Chief Engineer, appendix, Document D. and of the Superintendent of machinery, Document F.

The "Traveller" Engine, which was first put upon the road on the 10th of October, and which, like the Atlantic, has a vertical boiler, fully answers all the anticipations that were entertained of its performance, mentioned in the report of the Chief Engineer. The attaching of the pinion, through which the power is communicated to the wheels, to a seperate shaft has fully answered the purpose of giving steadiness to the machinery, and will no doubt very materially diminish its wear and tear. The "Traveller" is an excellent illustration of the propriety of devoting every attention to the vertical boiler engine, and exhibits numerous points of superior excellence over its predecessor, the Atlantic. When it is considered, that the horizontal boiler engine, of England, has been brought to its present excellence, after the experience and experiments afforded by its constant use for a long time; and that it is, as may be safely said, inferior in point of durability, and power to generate steam, to the first attempts with vertical boilers, it is not unreasonable to believe, that the latter will supersede all others, and every effort will forthwith be made, to put a competent number upon the road.

Besides the improvements in the locomotive engine, others have been made in the machinery used by the company, and particularly in the construction of the wheels of the cars—by which an iron rod is introduced into the rim of the wheel when cast, which not only adds to the hardness of the outer surface, by perfecting the chill, but increases in a great degree the safety of the wheel itself. Improvements have also been made in the burthen cars, tending materially to diminish the wear and tear of them; and with a view to the employment of steam, the passenger cars will hereafter be so constructed as to carry neither passengers nor baggage upon the top—by which a very great saving in the first cost of them will be effected, and the chief cause of injury to them will be avoided. At the same time, every attention will be paid in the construction of the cars, to render them, both in winter and summer, comfortable to those that use them. For a more full detail of this department, reference is made to the report of the Chief Engineer, and of the Superintendent of machinery. [See appendix, Documents D. and F.]

The company having thus, by a series of experiments and gradual improvement in the various machinery and motive power, arrived at a state of information sufficient to become the manufacturers of their own engines, and the Board having hitherto been unable to enter into satisfactory contracts for them, they determined to erect upon their own grounds suitable buildings, and provide the requisite means to construct all that they may require, as well as to keep them in a state of repair. By this course, the Board have no doubt that a considerable reduction will be effected in the cost of the machinery and moving power.

The Board of Directors have now gone over those subjects which, at the commencement of the official year, claimed their particular attention; and upon a review of the events of the last twelve months although they still find themselves pressed by many difficulties, yet they also find much cause for congratulation. A dispute with the Chesapeake and Ohio Canal Company, which after the decision of the courts, threatened serious injury to this company, has been amicably and happily settled, and a good feeling exists between the two corporations, which, as their interests will hereafter be closely connected, by the extensive advantages they will reciprocally confer upon each other, it is hoped and believed that nothing will occur to disturb. The way to the west through the Valley of Virginia is now open to this company. The Conococheague offers an easy access far into the interior of Pennsylvania; and the Potomac, when circumstances will admit, is still open as one of the avenues of western intercourse. The construction of the lateral rail road to Washington is secured, together with the advantages that must, in a pecuniary point of view, accrue to the company, from that work, when it becomes the channel of communication, not only between Baltimore and Washington, but between Baltimore and the Chesapeake and Ohio Canal, and the country on the borders of the lower Potomac: at the same time improvement has advanced with a steady pace in every department of the company, and upon reference to the report of the Superintendent of transportation, [see appendix, Document G.] it will be perceived that there has been a steady and satisfactory augmentation in the revenue of the company, accompanied by a comparatively, small increase in the expenses of transportation. In fine, the Board of Directors see nothing now which can possibly interfere with the early completion of the work to points, where it is believed that every reasonable anticipation of profit and advantage both to the stockholders and the public will be fully realized.

For a statement of the receipts and expenditures of the Company during the past year, and for an exhibit of its general fiscal concerns, the Board refer to the report of the Treasurer, [see appendix, Document H.]

On behalf of the Board,

P. E. THOMAS, *President.*

October 7, 1833.

APPENDIX.

[A.]

Extract from the minutes of the proceedings of the President and Directors of the Chesapeake and Ohio Canal Company, had May 7, 1833.

The President of the Company, from the committee appointed on the 6th ultimo, to confer with the committee of the Baltimore and Ohio Rail Road Company, made the following report:

The committee appointed, by the order of the Board of the 6th of April last, to confer with a committee of the Board of Directors of the Baltimore and Ohio Rail Road Company, have performed that duty; and after several conferences with that committee, as well in Washington, as on the line of canal, and in the city of Baltimore; beg leave to recommend to the President and Directors the annexed terms of compromise, in lieu of the 1st section of the act of the General Assembly of Maryland, entitled "An act to provide for the continuation of the Baltimore and Ohio Rail Road to Harper's Ferry, and other purposes," and of sundry conditions contained in the said act; which, in all other respects, except the modifications thereof, contained in the annexed terms, is left unchanged.

The committee deem it unnecessary, if not inexpedient, to enter into a narrative of the various opinions expressed by themselves or the committee of the Rail Road Company in the progress of their negotiation; but avail themselves of this occasion, to do justice to the candor which marked the course of the committee of the Rail Road Company, and to express a hope, which the assurances of those gentlemen, composing that committee, tended to confirm, that, if the proposed arrangement shall meet the approbation of both companies, the harmony, which it is so desirable to establish and preserve in their future progress, will be restored to their mutual benefit.

C. F. MERCER,
W. GUNTON,
W. SMITH.

The Chesapeake and Ohio Canal Company and the Baltimore and Ohio Rail Road Company, by their respective committees, covenant and agree to the following terms of compromise, subject to confirmation or rejection by their respective companies.

1st. To accept the act of the General Assembly of Maryland, entitled "An act to provide for the continuation of the Baltimore and Ohio Rail Road to Harper's Ferry, and for other purposes," within the time limited by the said act for the acceptance thereof by both companies, so as to secure to each its intended benefits. And as the purpose which the Legislature of Maryland had in view in passing the same, will be more effectually attained by a modification of some of its conditions, the said companies mutually and reciprocally covenant and agree, in the event of such acceptance by both, faithfully to fulfil the conditions hereinafter inserted for their common benefit, and so far to modify those stipulated in their behalf by the act aforesaid, viz:

The Baltimore and Ohio Rail Road Company, in consideration of the damage that may be done the Canal, and of the interruption or hazard to which its navigation will be unavoidably exposed, in the construction of the Rail Road along the margin thereof, bind themselves to pay to the Chesapeake and Ohio Canal Company, for grading the four miles and one-tenth of the road between Harper's Ferry and the Point of Rocks, hereinafter described, the sum of two hundred and sixty-six thousand dollars. The said four miles and one-tenth of road shall consist of a space to be laid between the entrance of the bridge at Harper's Ferry and a point of two miles therefrom, according to the location of the said road, which point will be below Millar's Narrows: of one mile and one-twentieth, extending from a point opposite to the door of the chief public house, at the Point of Rocks, up the valley of the Potomac, comprehending the Lower Point of Rocks; and of one other mile and one-twentieth, extending above and below the Upper Point of Rocks, so as to comprehend the same; embracing all that part of the canal border at those places in which an interference exists between the location of a canal and rail road. In making as well as locating the said road, the Chesapeake and Ohio Canal Company shall act in conformity with their own judgment, subject to the conditions, as to the curvature, inclination of surface, and the breadth of the said road, which the act of the General Assembly of Maryland prescribes; except that so much of the said road as is expected to be hereafter common to the Frederick and Harper's Ferry Turnpike Company and the Rail Road

Company, shall be of the breadth, at the surface, of not less than thirty feet, instead of twenty, for the better accommodation of both these companies.

Should the Canal Company prefer it, they may begin the lowest section of said road, at any elevation opposite the tavern at the Point of Rocks, not exceeding four feet above that of the road now constructed at that place; and, in case of a change of the present elevation, the expense of raising the present road and its appurtenant fixtures, so as to adjust the same to the road below, and its extension above, shall be at the cost of the Rail road Company; and shall be done at such time, as they may please to direct; Provided, however, that at the lower termination of the pass, through Millar's Narrows, above mentioned, at both terminations of the pass by the Upper Point of Rocks, and at the upper termination of the pass by the Lower Point of Rocks, the Baltimore and Ohio Rail road Company may, if they please, in fixing the elevation of these points, or termini, unite an engineer of their own appointment with the engineer of the Canal Company, charged by the same to make the location thereof, so as to adjust those points to the intermediate rail road, according to the terms of the said act of the General Assembly of Maryland; and the Canal Company may, in like manner, unite their engineer with the engineer of the Rail road Company, in fixing the intermediate location of the Rail road according to the said terms.

In the construction of the graduated road aforesaid, for the four miles and one-tenth, before mentioned, and in satisfaction of all injuries that may be done the canal in the construction of the said road, and as indemnity for any injuries that may be done the navigation thereof, during the construction of the said road, payments of the $266,000 shall be made monthly by the said Rail road Company, in the following proportions, viz: one-twelfth part thereof on the first day of June next, and one-twelfth part on the first day of each of the following months, until the said graduation shall be completed; but if the same be completed earlier than the twelve months, allowed therefor, the residue unpaid, at the time of such completion, shall be paid on the first day of the month next ensuing the same.

The passage to the Harper's Ferry bridge, across the canal, from the rail road, shall be by a pivot, or drawbridge; the expense of attending which, shall be equally divided between the two Companies; and the elevation of which, above the bottom of the canal, shall remain, as at present adjusted, at three feet above the bridge across the Potomac, unless it be, hereafter, the pleasure of the Rail road Company to elevate it still higher. And the curves of the road, at the entrance of the defile or pass at the Point of Rocks, and at the crossing of the said point or draw-bridge, being not provided for by the act of the General Assembly of Maryland, shall be adjusted to the residue of the road, as conveniently, as can be done, in the graduation of the rail road by the Canal Company.

All expenses to be incurred, in condemning, or purchasing ground, or materials, for the location and graduation of the rail road, through the four and one-tenth miles aforesaid, shall be, as at all other places, where the land required, is not, now, the property of the Canal Company, at the proper cost of the Rail road Company; and where the said road shall occupy ground, now the property of the Canal Company, the Rail road Company shall obtain, and convey to the Canal Company, an equivalent breadth of ground, along the northern side of the rail road, for the future supply of materials to the canal.

It is, already, herein provided, that the portion of the rail road, at Harper's Ferry Narrows, shall be thirty feet in width, for the common use of the Harper's Ferry and Frederick Turnpike; and the Rail road Companies. The Canal Company will allow the use, by the Rail road Company, of any authority which they possess, to obtain permission from the Turnpike Company, to the Rail road Company, to lay their rails on the part of the said road common to both, the Canal Company being bound by their articles of agreement, only for the graduation of the said road, from the Harper's Ferry bridge, down to the point at which the said turnpike will diverge from the rail road, to ascend the hill above Millar's Narrows; and the Rail road Company shall, also adjust the surface of that bridge to the elevation of the pivot bridge across the canal, at their own cost.

The Rail road Company agrees not to continue the rail road further up the valley of the Potomac than Harper's Ferry, until the Chesapeake and Ohio Canal shall be completed as far as Cumberland, provided that the canal be completed thereto, within the term allowed by the charter of said Canal Company.

The period of twelve months, from the date of the acceptance of these articles of compromise, shall be allowed the Canal Company, to complete the graduation of the four miles and one-tenth of rail road before described; but the President and Directors of the Canal Company shall urge the contractors, who may undertake the same, to proceed with diligence, and to complete the graduation in the shortest time practicable, consistently with the health of the country.

In case of any possible difference of opinion, or disagreement between the two companies, in relation to the construction of these articles of compromise, such difference, or disagreement, shall be settled in the mode provided by the act aforesaid, for the settlement of the construction thereof, by the same parties.

The report having been read and considered, was accepted and approved.

The President submitted the form of a report of the Board to the stockholders about to assemble in general meeting this day, which was read and approved, and he was requested to present the same in behalf of the Board to the stockholders.

REPORT.

Report to the Stockholders of the Chesapeake and Ohio Canal Company in general meeting.

The President and Directors beg leave respectfully to submit, along with a copy of the act of the General Assembly of Maryland, in pursuance of which the present general meeting has been convened, a report, approved by them, of a committee of their Board appointed to confer with a committee of the Board of Directors of the Baltimore and Ohio Rail road Company.

By odrer, and on behalf of the President and Directors.

C. F. MERCER,
President of the Chesapeake and Ohio Canal Company.
Canal Office, Washington, *May* 7, 1833.
Copy test: JOHN P. INGLE, *Clerk C. & O. C. C.*

Extract from Journal of the stockholders of the Chesapeake and Ohio Canal Company of May 9th, 1833.

Resolved, That the consent of this Company be, and is hereby given to the act of the General Assembly of Maryland, passed at December session, 1832, entitled "An act to provide for the continuation of the Baltimore and Ohio Rail road to Harper's Ferry, and for other purposes." And that the President and Directors of this Company shall certify their assent to the Governor of the State of Maryland, in conformity to the provisions of said act.

Whereas it has been represented to this meeting, that the stockholders of the Baltimore and Ohio Rail Road, in general meeting, held on the 8th day of May instant, "*Resolved*, That the President and Directors of the said Company be clothed with full power and authority to make and execute, on the part of the said Company, such agreement in the premises with the Chesapeake and Ohio Canal Company, as to them should appear expedient and proper." And whereas, a committee of the Directors of each of said Companies did recommend the adoption of certain conditions, stipulations, and agreements, as hereinafter mentioned; and that the President and Directors of the Baltimore and Ohio Rail Road Company, did afterwards, viz: on the day aforesaid, resolve to agree, and did agree, to each and every of the conditions, terms, and stipulations specified and contained in a report made to them by a committee of that body, which had been appointed to confer with a committee acting on behalf of this Company, of the terms on which an agreement could probably be made in the premises between the two Companies, and which terms are contained in the report of the President and Directors of this Company to the stockholders thereof, viz: (for terms see pages 25, 26, and 27.)

Therefore, be it resolved, That the assent of the Chesapeake and Ohio Canal Company be, and is hereby given to each and all of the conditions, stipulations, and provisions specified and contained in the said report, and that a copy of the proceedings shall be made and delivered to the said Baltimore and Ohio Rail Road Company, in evidence of the assent of the Company to said conditions, stipulations, and provisions, as an agreement, and in exchange for a counterpart of said agreement to be furnished by the said Rail Road Company.

The foregoing resolutions were adopted by the following vote—Ayes, 6,904, Noes, 1,300.

Test: JOHN P. INGLE, *Secretary of meeting.*

Extract from the Journal of Proceedings of the President and Directors of the Chesapeake and Ohio Canal Company, May, 9, 1833.

The President communicated to the Board the following resolution, adopted this day by the Stockholders of the Chesapeake and Ohio Canal Company, in general meeting:

Resolved, That the assent of this Company be and is hereby given to the act of the General Assembly of Maryland, passed at December session, 1832, entitled, "An act to provide for the continuation of the Baltimore and Ohio Rail Road Company to Harper's Ferry, and for other purposes," and that the President and Directors of this Company shall certify this assent to the Governor of the State of Maryland, in conformity to the provisions of said act.

Whereupon, the President and Directors signed and sealed a certificate to the Governor of Maryland, giving the assent of the Chesapeake and Ohio Canal Company to the said act of Maryland, according to the provisions thereof, and the President was requested to transmit the same to the Executive of Maryland.

The President also communicated to the Board certain proceedings of the Stockholders of the Company of this date, adopting the terms of compromise, with the Baltimore and Ohio Rail Road Company, as contained in the report of the President and Directors to the Stockholders on the 7th inst. The President was requested to deliver to the Baltimore and Ohio Rail Road Company, an attested copy of the said proceedings of the Stockholders, under the seal of the Company, in exchange for an attested copy of the proceedings of that Company of the 8th inst. in relation to the said compromise.

Attest: JOHN P. INGLE,
Clerk Chesapeake and Ohio Canal Company.

His Excellency James Thomas, *Governor of Maryland.*

Sir: I have the honor to avail myself of the good offices of Mr. McCullough, of Baltimore, one of the Representatives of Maryland, in the late general meeting of the stockholders of the Chesapeake and Ohio Canal Company, to transmit to you, within the time prescribed by the act of the last General Assembly "to provide for the continuation of the Baltimore and Ohio Rail road, and other purposes," evidence of the acceptance of that act by the Chesapeake and Ohio Canal Company.

Mr. M. being also the bearer of the acceptance of the same act, by the Baltimore and Ohio Rail Road Company, I may, I trust, congratulate your Excellency, and the friends of internal improvement in Maryland, on this propitious removal of the recent bar to their friendly union, in advancing the prosperity of your flourishing commonwealth.

I have the honor to be, sir, with great respect, &c.

C. F. MERCER,
Pres. of the Chesapeake and Ohio Canal Co.

Extract of a letter from the President of the Baltimore and Ohio Rail road Company, to the President of the Chesapeake and Ohio Canal Company, dated 24th May, 1833.

"I have now the pleasure to enclose to thee a copy of some resolutions which passed the Board of our Rail road directors, upon the reception of the ratification of late agreement. I have entire confidence that this manifestation of good feeling will be received by the Canal Company, in the same friendly spirit which led to the adoption of these resolutions; and I trust that no circumstance will ever again occur to interrupt the harmony now happily restored between the two companies.

The funds are ready for the payment of our June instalment, under the existing agreement between the two companies, and the amount, say $22,333 33, may either be drawn for, payable on the first day of June, or the payment will be made in any other manner directed by thee."

At a meeting of the President and Directors of the Baltimore and Ohio Rail road Company,

May 18, 1833.

The President having laid before the Board a copy of the ratification on the part of the Chesapeake and Ohio Canal Company, and on the part of the Baltimore and Ohio Rail road Company, of the terms of agreement entered into between these companies, for the extension of the Rail road, on the north side of the Potomac river, from the Point of Rocks to Harper's Ferry, and for its passage over that river, and the same being read, it was, on motion,

Resolved, That as all causes of future unfriendly collisions between these works are now removed, and as the Canal and Rail road will, hereafter, from their relative positions, necessarily become reciprocally beneficial to each other, it is therefore the mutual interest of both companies to extend to each other every friendly aid and co-operation.

Resolved, That as the completion of the Canal to the coal mines, in Allegany county, as early as practicable, is not only demanded by the public interest, but would also materially benefit the Rail road, by furnishing a supply of coals and by affording, in connexion with this road, an extended channel of communication to the westward, by which the transportation through the Canal and Rail road, in both directions, would be greatly increased, this Board will cordially unite with the President and Directors of the Chesapeak and Ohio Canal Company, in all proper measures, calculated to promote these works, and will, in a spirit of sincere good will, be prepared harmoniously to co-operate with them to effect the same.

Resolved, That the President of this company forward to the President of the Chesapeake and Ohio Canal Company a copy of the foregoing resolutions, signed on behalf of this Board.

Extracted from the minutes of the Board, and signed on behalf thereof.
P. E. THOMAS,
President Baltimore and Ohio Rail Road Co.

Extract from the proceedings of the President and Directors of the Chesapeake and Ohio Canal Company of June 4, 1833.

The President laid before the Board a letter, of the 24th of May, which he intimated that he had just received from the President of the Baltimore and Ohio Rail road Company, covering certain proceedings of the President and Directors of that Company of the 18th of May last.

Whereupon, *it was resolved, unanimously*, by the President and Directors of the Chesapeake and Ohio Canal Company, that they cordially unite with the President and Directors of the Baltimore and Ohio Rail road Company, in the liberal sentiments expressed by them in their resolutions of the 18th of May, and that they will seek, by all proper means, to preserve the harmony which has been so happily established between their companies.

And be it further resolved, That the President of this company forward to the President of the Baltimore and Ohio Rail road Company a copy of the preceding resolution, signed on behalf of this Board.

Extract from the minutes of the Board, signed on their behalf.
C. F. MERCER,
Pres. of the Ches. and Ohio Canal Co.

Copy of a letter from the President of the Chesapeake and Ohio Canal Company to the President of the Baltimore and Ohio Rail road Company.

Canal Office, City Hall, Washington, *June* 4, 1833.

Dear Sir:

I take peculiar pleasure in becoming the medium for communicating, through you, to your Board the enclosed resolution, and avail myself of the occasion to renew to you the assurance of my high respect. Your obedient servant,

C. F. MERCER, *President*

To Philip E. Thomas, Esq.
President of Baltimore and Ohio Rail road Company.

(B.)

Office of the Baltimore and Ohio
Rail Road Company.

"A report was received from the Chief Engineer upon the surveys and calculations made with a view to the location of the Washington Rail road, which was referred for examination, to Messrs. Morris, Potts, Donaldson, Swan and Magruder, who were desired to report to this Board the relative advantages of the several routes that have been surveyed. Also, the extent to which the right of way may have been granted to the Company."

The Committee have performed the duty assigned in the foregoing resolution, by a careful examination of the Engineer's report, which is of great length, and presents in detail to the consideration of the Board, the various routes through which the road may be conducted—is minute in the calculation of the prime cost of the railway, and a comparison of the several modes of construction and their durability, and treats upon the motive power and machinery, and the difference in the expense of that power as applied to the several routes, &c. &c.

By a reference to the report, and the accompanying tables and plat, it will appear that there are twelve practicable routes indicated—ten of these may, however, be considered as versions or modications of the other two, designated as No. 2, or upper route, and No. 12, or lower route.

The advantages which the upper and lower routes maintain above all others, are such as virtually to exclude all but Nos. 2 and 12 from any further notice in this report.

In examining the relative merits of Nos. 2 and 12, the question is necessarily and inseparably connected with the various branches comprised in the Engineer's report. To render justice to the report, and at the same time disengage it of the minute calculations introduced to sustain the Engineer's conclusions, and to reduce the question to such a space as to render it susceptible of being generally appreciated, the committee have had the subjoined table (A) prepared—it exhibits at one view a comparason of the upper and lower routes, in relation to the various questions, such as distance, time consumed in the transit upon them, cost of construction; repairs, cost of motive power, &c., machinery to be applied thereon. The report represents the length of the lower route from the Baltimore and

Ohio Rail Road near to "Hockley Mills" to Washington, as ascertained by measurement, to *be in miles*, - 32.2052
And from and to the same points on the upper route as 29.3469
Constituting a difference in distance in favor of the upper route, - - - - - 2.3583
Or rather more than two miles and one-third

The time required to travel from Baltimore to Washington by the lower route is estimated to be 2 hours, 7 minutes
And on the upper route, - - 2 "
Difference in time, - - - 7 minutes

From the same authority we learn that the difference of cost between the upper and lower routes in graduation, masonry, bridging, double track of railway, cost of restoring the embankments during the first five years, with the ordinary repairs of graduation and masonry united, will be *in favor* of the *lower rowte*, the capital sum of $48,836, which will be equal to an increased annual expense on the upper route of $2933 16
On the other hand, it is estimated that when the two roads will require *repairs* and renewals of the double railway, and two engines for freight and two for passengers are in operation, the difference in cost of those items will be in favour of the upper route, the capital sum of $36,833 33, or a reduced annual expense, consequently that route is entitled to be credited the sum of - - - - 2210 30

The difference in the outlay in the upper and lower routes, bringing down the enumerated disbursements of each route successively to the period when the expenditures are incurred on account of construction, repairs and renewals, and with *two engines for freight* and two for passengers are in operation, which it is supposed will be the least number competent to transport the traffic of the road, it is at this point that the work may be considered as to have been consummated and the inevitable expenses incurred, so that the relative merits of the upper and lower routes, so far as they relate to cost of construction, repairs, renewals and the use of motive power, can with propriety be compared and a balance struck, by which it will be perceived that at this stage of the inquiry there yet remains a difference between the upper and lower routes, in favor of the latter, the capital sum of $12,047 66⅓, or an increased annual expense on the upper route of - - - $722 86

A reference to the note in table A. will enable the board readily to estimate the annual expense of working *one* engine on the lower route contrasted with the upper route, it will there be seen that on the *Lower Route*,

The cost of fuel is estimated at -	$3,291 35	
Wear and tear - -	5,041 49	
		8,332 84
Upper Route,		
The cost of fuel is estimated at	$3,204 59	
Wear and tear, - -	4,762 56	
		7,967 15
Shewing the annual difference in the working one engine to be in favor of the Upper Route the sum of		365 69

The Committee forbear to pursue the comparision further, than merely to add, that the Engineer's Report estimates that when the trade upon the road shall require four freight and four passenger engines, with the train of cars necessary for an advantageous use of the motive power, the difference of cost will be in favor of the upper route, the capital sum of $9,078 66⅓, or an annual sum of $544 72.

In the present inquiry, the Committee have weighed the question of immediate or first cost of construction, repairs and renewals within a definite period, and the cost of transportation with the machinery, assumed as the minimum requisite for the wants of the public when the road is first in use, in connection with which they consider a prudent forecast as to the probable future operations of the road, and it appears that the cost or expenditure on the two routes at a period when *two engines* for freight and three for transportation are in use, will be so nearly equally poised, as to present an inconsiderable difference in favor of the upper route—which, as has been stated, increases with the introduction and use of engines. The difference in distance exceeds two miles and one third, is in effect a gain of near six per cent. in time, acquired at the increased expense of less than one per cent. ($12,047 66⅓) on the estimated cost of the work. It has however been shewn that this discrepancy will not rest here, but in the progress of time, and for causes which have been enumerated, there is reason to believe that the scales will be turned in favor of the upper route. The arguments advanced by the several advocates of the upper and lower routes, do not,in the estimation of the committee, vary the question, but leave the subject wholly unaffected by them. The lower route approximates a fertile and affluent neighborhood. The upper route passess in the vicinity of a manufacturing community already arrived at a period of some consequence, and susceptable of a material augmentation. It is believed that the reasons for a departure from the course which is the most eligible for the population convened and to be accommodated at the *termini* of the road, are not of sufficient consequence to induce the adoptionof the upper or lower routes on account of any increased advantages that may accrue to the company by the immediate traffic—and that the question is left to be deliberated upon on grounds wholly independent from such considerations. In reviewing the inquiry in reference to cost of construction and those repairs and renewals entailed upon the work, in connection with the expenses of machinery motive power immediate and anticipated, distance, difference of time required to pass and repass from Baltimore to the seat of government, the commmittee unanimously concur in the opinion, that by the selection of No. 2, or the upper route, it would be most subservient to the convenience of the public, and at the same time best promote the permanent interests of the stockholders, and therefore present a specific question for the consideration of the board comprised in the accompanying resolution.

All which is respectfully submitted by

JOHN B. MORRIS,
JAMES SWAN,
Directors on the part of the stockholders.
R. B. MAGRUDER,
Director on the part of the state.
JOHN I. DONALDSON,
Director on the part of the city of Baltimore.
Committee.

Sept. 23, 1833.

Resolved, as the sense of this Board, That in the construction of the Washington Rail road, that No. 2, commonly called the upper route, as laid down in the map, and referred to in the Engineer's report, is the most eligible one, and that the same is hereby adopted, and that the Engineer be, and he is hereby instructed, forthwith finally to locate and prepare the some for contract.

Continuation of Document B.

The Committee who were appointed to investigate the question as to the selection of the route of the rail road to Washington, make an additional *Report*, relative to the right of way as secured in the upper and lower routes. The accompanying schedules B, No. 2 and A, No. 12, contains the names of the several property-holders, and shews the number of front feet of each proprietor. By an examination of the several communications containing relinquishments, it appears that the unqualified relinquishments (and those that are so in effect) amounts on the

Upper Route to - - - -	32,750 feet
Lower Route to - - - - -	23,600 "
Constituting a difference in favor of the Uppper Route, - - - - -	9,150 "

The Committee avail of the occasion to express their conviction of the great importance to the interests of the company, that efficient means be adopted to procure such relinquishments as can be obtained from those who *will*, but have not yet ceded the right of way to the company.

Yours, respectfully,

J. B. MORRIS,
JAMES SWAN,
JOHN I. DONALDSON.
R. B. MAGRUDER,

Sept. 3, 1833.

(C.)

Baltimore and Ohio Rail Road Company.

The undersigned Committee, who were appointed on the 30th May last, to examine into the nett profits of this Company for the six months ending the 30th June, 1833.

"Also to ascertain the amount of interest paid for funds borrowed in anticipation of the several instalments called.

"And further to take into consideration the most proper means of providing for the interest which will accrue upon loans about to be negotiated for the construction of the Washington Rail road, until that road will become profitable,—and submit the same to the Board:

And also, further to report their opinion upon the amount of dividend, if any, that it may be right to declare, upon the current six months' business of the Company."

REPORT, that the receipts for transportation during the last six months appears by the accompanying statement of

the Superintendent of Transportation marked A. to have been,		$92,556 86
That the expenses of transportation, and the salary of the Superintendent of Transportation were	$41,534 35	
That the repairs of the road, machinery and attendance on the same, and salary of superintendent of machinery were	18,374 89	
The wear and tear of horses and harness is estimated at	2,800 00	
		62,709 24
Leaving, after deducting the foregoing items, the sum of		29,847 62
From this balance, it is the opinion of the committee there should be deducted the amount of interest paid on the loans since January last,		8,683 33
So that there remains as nett revenue of the Company for the six months ending the 30th June the sum of		21,164 29

It will be recollected that in the progress of this work, involving heavy expendentures, the source of which was mainly dependent upon individual subscriptions for its payment; the board wisely, as we think, deemed it advisable to urge on the work to a speedy completion, and in doing so, not to press too rapidly on the stockholders for instalments, peferring to pledge the company in its corporate capacity for considerable sums of money, indispensably necessary towards forwarding their designs; hence have arisen the existing liabilities for advances and interest on them. The money borrowed has been applied to the construction of the road, and had not the Company obtained it, instalments must have been called for at the time of effecting the same, and would have been obeyed, as it is believed, with great inconvenience at that period to many Stockholders. Justice and propriety seem to dictate, that the interest on these loans should be defrayed out of the current profits of the concern, previous to the making of any dividend on the stock, and that this item is fairly chargeable as one for administering the affairs of the Company, and not to its construction.

The policy hitherto adopted to urge the work forward, and, at the same time, mitigate the demand upon the stockholders, it is the opinion of the committee, will have in a degree to be pursued until it shall have been completed to Harper's Ferry. This being assumed as the course the company will pursue, it necessarily follows, that, with the liabilities already incurred, and those that will ensue for work to be executed, on the one hand; and, on the other, the instalments called for being inadequate to cover the debt incurred, and to accrue from the completion of the road to Harper's Ferry, it results that the company for some time to come will be subject to the payment of an interest account.

Having examined into the first portion of the duties assigned the Committee, it remains to suggest the proper means of providing for the payment of the interest on loans to be effected for the construction of the Washington Rail Road, and to the question of a dividend on "the current six months business of the Company." By an act of the General Assembly of Maryland, passed at their last session, the Baltimore and Ohio Rail Road Company were constituted the agent to construct a rail road to Washington.—This law did not contemplate that the Baltimore and Ohio Rail Road Company should necessarily become a stockholder. It was estimated that the Washington Rail Road would cost about $1,500,000, of which $500,000 was reserved for the state, $600,000 for certain corporations, and the residue was to be open to individual subscriptions. It was only in the contingency of the corporations and individuals failing to subscribe for the stock allotted to them that the Baltimore and Ohio Rail Road Company had the power to become a stockholder.

The corporations which had the pre-emption wholly declined, and individuals participated in only an inconsiderable degree. This condition of things now presented to the stockholders of the Baltimore and Ohio Rail Road the alternate proposition to abandon the work, or that they should avail of the privileges extended by the act.

The present inquiry grows out of the determination of the Stockholders, who, at a general meeting, by a large majority, resolved to accept the law and take all the unsubscribed stock. It is not necessary further to review the reasons which induce the measure than to state the expected advantage which the Baltimore and Ohio Rail road Company would derive, without any additional outlay, from the use of that part of the road already constructed.

The Stockholders having determined to accept the law and construct the Road, the only means of doing so will be by loans to the entire amount of the Baltimore and Ohio Rail Road Company's proportion of a work, which it cannot with propriety be supposed will yield any considerable return until it shall have been extendend to Washington. It does appear to that Committee that the enterprise having been resolved on, and to be effected by loans, the only means at the disposal of the Board to provide for the payment of the interest on these loans, is the revenue, of the Baltimore and Ohio Rail Road Company. It cannot be disguised that a respectable portion of the stockholders doubt the propriety of the course here suggested, and believe that it should be deducted from the loans which may be made. Whilst the committee entertain a respectful consideration for the source from whence the objections come, they do not acquiesce in their correctness; and, in justice to the views which dictate this report, would draw the attention of the Board to the fact, that the state and individuals are stockholders, and will be required to pay the instalments, on their respective shares, in cash or an equivalent. Should the Baltimore and Ohio Rail road Company, a Stockholder for near two-thirds of the whole work, provide for the payment of the interest of thier stock out of the loans, it is obvious that the state and individuals have a right to be credited with an abatement equal to the interestpaid by the Baltimore and Ohio Rail Road Company, and the fund designed for construction will be materially diminished in the payment of interest, rendering it necessary for each stockholder to make a further provision to obtain a fund sufficient to complete the work, thereby enhancing its nominal construction.

The Baltimore and Ohio Rail road Company, as a stockholder, stands in the same position in relation to the work as other stockholders, and on every share, it is immaterial who may be the possessor, the instalments must be paid, *pari passu.* If this be correct the interests on the loan cannot be deducted from stock to be filled up by the Baltimore and Ohio Rail road Company, and, at the same time, withheld from another class of Stockholders.

If the position assumed is the true one, does it not follow that the interest on loans must be paid from some other fund?—If so, there is none to be resorted to but the *Revenue* of the Baltimore and Ohio Rail road Company. Under these impressions, with a work of such great magnitude about to be commenced under circumstances as detailed, the Committee consider that it would be improvident, and injurious to the permanent interest of the Stockholders to make any dividend of the nett profits of the last half year, and that it will be best to retain that fund to meet the exigencies that may arise, by extending the road to Harper's Ferry, and constructing the road to Washington.

The circumstances detailed may not, at first view, appear of so flattering a character as may have been anticipated, but on an examination of the affairs of the Company, the Committee trust there is every thing to hope for in a future, and in confirmation of this opinion they will contrast the receipts and expenditures of the first six months of the last two years—the result of which is as follows:

Income.		*Expenses of Transportation.*	
1832,	$78,160 44	1832,	$41,414 29
1833,	92,556 86	1833,	41,534 35

When the road shall have reached Harper's Ferry, and communicated with the rich valley of Virginia, by a junction with the Winchester Rail road, a great increase to this income may fairly be calculated upon, and on the completion of the road to Washington, the use of that part already constructed to the Patapsco will, without doubt essentially benefit the Baltimore and Ohio Rail Road Company, while at the same time it is anticipated that this company will receive a fair and reasonable remuneration for the employment of its credit and resources in the construction of the Washington Road. And under all the circumstances of this corporation, the committee entertain a confident hope and belief that at no distant day, its resources will be found ample to meet all the liabilities it has contracted for the construction of the road to Washington, still leaving a gratifying surplus to be divided among the Stockholders.

We have engaged in a noble work, and single handed have been the pioneers in the United States in the cause, and although great difficulties have ensued in the prosecution of the enterprise, we are animated with the hope of a favorable termination.

All which is respectfully submitted,

JOHN B. MORRIS,
JNO. McKIM, Jr.
H. W. EVANS,
Committee.

July 12th, 1833.

(D.)

Fourth Annual Report of the Chief Engineer of the Baltimore and Ohio Rail Road.

Engineer's Office, Baltimore
and Ohio Rail Road.
Baltimore, Oct. 5, 1833.

To Philip E. Thomas,
President of the Balt. & Ohio Rail Road Co.

The fourth annual report of this department which I have now the honor to present, will be rendered the more brief on account of the advanced stage and the greater maturity of our operations. In the more early progress of this work, with the very limited stock of information then before us, it was found indispensable that novel applications of principles should be investigated, and that many experiments should be made, requiring the utmost skill and science at our command, and the most anxious care and industry on our part in order to arrive at safe and satisfactory conclusions.—These investigations have been actively prosecuted; principles have been combined; many experiments, involving very complicated details, have been made, and results of high importance to the rail road system have been obtained; the railway has been put into successful operation, and it now only remains to pursue the design by giving to the machinery its required extension, and availing of its utmost perfectability, in order to accomplish to the fullest extent of economy the great task in which we have been engaged.

In my last annual report it was announced that the new locomotive steam engine "Atlantic," built by Davis and Gartner of York, Penn. had performed satisfactorily with anthracite coal as the fuel, through the test of a month's use on the rail road. This engine employs cast iron chilled wheels, three feet in diameter, and is geared to obtain twice the speed on the road that would result without the gearing, with the same velocity of piston, and is constructed with the upright tubular boiler of Cooper.

Much service has been performed by this engine in the course of the past year; but as several such machines would have been required to do all the work of transportation, and as these were not upon the road, the entire horse establishment had still to be maintained, and consequently it was not desirable to work this engine to a greater extent than would be necessary to evince its continued efficiency, or to detect its errors or deficiencies, should any be found to exist either in principal or construction. This precaution of subjecting it to a sufficient test seemed to be necessary, previous to venturing upon an expenditure on many such machines, and more so as from unavoidable defects in the consistency of the material of the working parts, (common to all machines,) and the complication and great and sudden variation in intensity of the strains upon them in the course of loco-motion, our knowledge of the correct proportions of these parts could be obtained only through experience. This engine is still in operation, and the result is entirely satisfactory, as to the boiler and the combustion, as well as the exclusive use of anthracite coal, and consequently as to the *power* of this machine, and nothing more is wanted to demonstrate the entire practicability and utility of this fuel for the locomotive engine. It is true that some economy of fuel may be realized from slight modifications in the fire place, boiler and tubes, and especially, by giving addititional length to the latter. The modification last mentioned has already been resolved upon in relation to future engines. Although the engine has been in use many months, and has run upwards of 13,000 miles, yet not a single tube has failed or given way, and consequently, there is reasonable ground to expect that the tubes, (though of iron,) will be comparatively durable.

The circumstance of a more rapid change of place and circulation obtaining amongst different portions of the water, and the impossibility of the subsidance and lodgment of sediment upon the tubes when these and the boiler stand upright, would lead us to expect, independent of experiment, a greater duration of the tubes, than when they are horizontal in a boiler of corresponding position. The time which the tubes have lasted in the Atlantic, and the frequency of their failure in the English engines, when the position is horizontal, appears to confirm the foregoing conclusion. The English have employed both iron and copper tubes, but still complain that the frequent failure of these constitutes one of the greatest sources of expense attendant upon the working of the locomotive engine, and tubes of brass are proposed at Liverpool as likely to produce economy. With the upright boiler however it does not appear that much loss, from the burning out and bursting of tubes, will be experienced. Nevertheless in my report of the 27th July last, hereunto annexed, marked W. R. in relation to the proposed Washington railway, I have estimated the annual cost of tubes for an engine in constant use at $504. That this sum will be fully adequate to the object, there can now be but little doubt.

Two points of great interest, therefore, in relation to the value of steam locomotion upon railways have been determined, and efficiently combined under the auspices of the Baltimore and Ohio Rail Road Company upon their road, viz: 1. *The upright tubular boiler*, and 2. *The successful application of anthracite coal.* The first has the advantage of durability, compactness, and above all, of a most rapid generation of steam; the second gives a cheap fuel, free from smoke and sparks, for locomotives employed in the states bordering upon the sea coast. The latter will sooner or later be viewed as a most useful attainment in connection with the railway system, when the benefit which this company will have conferred upon the community in attaining this object will be felt and acknowledged. From a recent discovery of anthracite coal on the Potomac river, it is probable, that the price of that fuel will yet be reduced much below its present cost, and that the advantages to the company from the employment of the locomotive engine, will be proportionally increased.

The course of trial, however, that tested and proved the adequacy of what may be denominated the vital parts of the Atlantic engine already described, has, at the same time, served to discover certain defects in the consistency and proportion of those working parts most liable to wear and break. It was found that the driving road wheels, each of which worked upon the rail, with an insistent weight of two tons, soon yielded to the action and became worn, especially upon the more conical part near the flange, where the form became changed in a considerable degree from the circular to the polygonal—causing jolts and concussion, especially when the engine moved at considerable speed; and abating the efficacy of the machine, more particularly in curves, whilst the unevenness in the motion tended to injure the spur and pinion wheels, whose office it is to multiply the speed. Moreover, the axles that were at first used, proved too weak to withstand the strains to which, at times, they were subjected, and their fracture, and simultaneously that of the spur and pinion, ensued. In all this no fault could justly attach to any one, dimensions had been given that seemed ample to oppose the probable strains, and from calculation, based upon the experimental trials of the strength of malleable iron, and the assumed probable stress, the result was equally favourable to a sufficiency of strength. But to the well ascertained strains to which the revolving parts of local or stationary engines are subject, there was superadded in the progressive motion of the locomotive, certain lateral impulsions of unforeseen and therefore unknown intensity, that presented a problem in which a new term had to be determined experimentally in the running of the engine itself upon the railway. Accordingly the axles have been increased in diameter so as to withstand the trials to which they are liable. This remedy was a plain one. The comparative strength being as the cube of the diameters, a small increase of dimension in that direction would render the strength relatively insuperable. It was likewise found that sufficient strength to prevent fracture could readily be given to the cast iron locomotive road wheels of three feet in diameter. But the evil already alluded to of a deficient degree of hardness to be obtained in the process of chilling was a very different affair, and not to be remedied by simple addition of dimensions. It was discovered that by the method hitherto practised, the three feet wheels were less effectually chilled than the two and a half feet wheels; and this was accounted for from the known fact that, in cooling, the larger wheel would contract to a greater extent, and recede further from the rigid iron chill, applied to the exterior of the periphery, than would the smaller wheel, from the chill applied to it; and, consequently, in the case of the larger wheel, although the exterior of the rim should be chilled in the instant of casting, yet on receding from the cold iron of the chill, the interior unchilled parts would immediately impart a portion of heat to the exterior chilled parts sufficient to *anneal* the latter, and destroy the effects of the chill. Thus the efficacy of a coned wheel, if more than two and a half feet in diameter, seemed to be lost; and the consequences would have been serious. The science, skill and genius of the Engineers and Mechanics in the service of the company were therefore now directed to this point, and I am happy to be enabled to state in this communication that two successful methods of attaining a good and perfect chilling have been suggested and put into practice. The one method consists in applying to the inner periphery of the rim on the side of the spokes next to the flange and in the region of the conic part, *a second chill concentric with the first or exterior chill.* Now as the contracting metal, immediately after casting, recedes from the exterior chill, it would press upon the interior one whilst the contact would cause the latter chill to absorb the heat that would otherwise have *annealed* the exterior periphery of the rim and destroyed the hardness already communicated from the exterior chill. The process in trial, justified the expectation and a perfect chilling was attained, precisely in that part of the rim where most needful. This manner of effecting the object was first proposed by Ross Winans, assistant Engineer of machinery. In the commencement the failure of this process was threatened from a mechanical difficulty that may here be mentioned with the obviating expedient that proved effectual. So soon as the fluid metal should begin to cool it would shrink and contract upon the interior chill of cold rigid iron and with an intensity increasing rapidly with the abstraction of heat, at the same time that the malleability would diminish, and the consequence would be fracture. At first it was suggested to elevate, by means of a lever and appropriate connections, the chill from the rim of the wheel as the latter should contract, a slope upon the surface of the chill being given to facilitate the operation. It was however thought to be difficult if not impracticable to execute this design for every wheel and with proper and timely effect, and it was abandoned for the effectual method that immediately succeeded in the course of thought, and which bears the test of experiment. It is simply to give such a slope to the face of the chill, that it shall slide on the correspondingly sloped face of the casting as the latter shall cool and contract. The form of the chill is that of a conic frustrum with the smaller end downwards upon the arms of the wheel, and the slope of the slant side makes an angle with the axis of the cone of 30 degrees, and imparts to the interior surface of the rim of the wheel a form consistent with strength and symmetry. As the metal cools in the new cast wheel its contractile force overcomes upon that angle the friction,gravity, and inertia of the chill which slides upon the grasping metal of the rim, and is elevated, presenting in its upward movement successive lesser dimensions to the contracting wheel, whilst the latter from its tenacity being more than equal to the sum of the three forces that oppose the displacement of the chill vertically, is not fractured. In this process the rim of the wheel is chilled and hardened thoroughly from the exterior to the interior side between the flange and the part where the spokes attach. It is consequently however rendered more liable in use to be fractured from concussions upon the railway; but this may be obviated by adding metal and giving additional thickness to the rim.

The other method of securing the efficacy of the chilling process in a very effectual degree, was proposed by Phineas Davis, and consists in casting the rim so that the fluid metal shall surround and enclose within its body a ring of cold malleable iron concentric with the wheel. The effect of the presence of the ring in the interior of the body of the casting, is, to abstract the heat from the fluid mass to an extent that assures a perfect chilling on the exterior of the rim, notwithstanding the recession from the chill, in cooling; whilst the chilling power of the ring does not extend to harden the inner or opposite side of the rim, which is therefore not quite so liable to fracture as if chilled according to the method previously described. The method with the ring or rings (for there may be two of them) has the superadded good property of giving strength to the wheel, and safety from disaster in case of the fracture of the cast metal in rapid movement upon the railway, since the tenacity of the malleable ring or rings situated in the midst of the body of the rim and pervading the whole length of the periphery, will be competent to hold the wheel together and prevent its parting even after the occurrence of a fracture in the rim. Several wheels formed after this method were broken with a heavy sledge hammer, but the segments of the fractured rim were still held together by the tenacity of the unbroken malleable ring, which last was found to be so exceedingly tough, that it was necessary to cut it before the broken parts of the casting could be disengaged one from the other. These examinations furnished ample evidence of the very best of chilling due to the presence of the ring and of its probable value as a ligament to give strength and safety to the cast iron railway wheel. The principle and its efficacy having been applied and ascertained, it remains to reach the utmost advantage by the necessary modifications and adaptations; to ascertain whether there should be two rings or only one; what should be the thickness of iron composing them; what form of section, whether round, square, or otherwise; what should be the thickness of the rim enclosing them; and what should be their best position in the area of the cross section of that rim, &c. It is probable that a single ring to a wheel will be entirely sufficient, and that for a three feet wheel it should have a rectangular section equal in area to about the fourth part of a square inch.

The wheels now upon the Atlantic engine have rings in them and they work and wear satisfactorily: and it is confidently believed that this discovery will be of great advantage in locomotive wheels as well as in those of passenger coaches drawn by steam power at high velocities, and that a wheel made after this manner might well be denominated *the safety wheel.* Whether for car wheels in general and of a diameter not extending about two and a half feet, the first or the second method of chilling, as already described will be on the whole, preferable, cannot now perhaps, be fairly decided, but must probably be left to the lights of maturer experience.

From the improvements and modifications already made and matured, no doubt is entertained but that the company can have constructed in their own shops now constructed for that purpose, and for other objects connected with their railway machinery, locomotive engines of a very efficient and comparatively economical character, and more so, perhaps, than those of any other model hitherto imported from Europe. I do not hazard this sentiment from a mere feeling of partiality to the genius of our countrymen, but from a belief that the results will be fully realized. Notwithstanding, if it shall be thought proper, one or more English engines of the most approved form and construction might be imported and probably used with advantage upon the railway, now being made to Washington, inasmuch as from the straightness of that road, an opportunity will there be afforded for a fair comparison between rival machines of this kind and of the mostvaried form.

Since the time of the last annual report, a second locomotive engine, built by Phineas Davis, was placed upon the road. This machine differed from the Atlantic engine in being lighter and in the substitution of the crank axle, in lieu of the spur and pinion wheels, the position of the cranks being inside of the road wheels. The engine was calculated for the slower speeds, and was intended to be employed in the conveyance of commodities. The power of its traction was perhaps equal to that of the Atlantic engine, in proportion to the weight or the adhesion upon the rails, but the economy of fuel was probably rather greater in the Atlantic. Upon the whole the new engine was a good one, though somewhat inferior to the other. From some cause, the crank axle was broken, and a question arose whether it was not advisable in repairing the engine, to gear it in the same manner as the Atlantic, the performance of which had been very satisfactory. After mature deliberation it was resolved to gear it by placing the pinion upon a shaft distinct from the axle of the road wheels, having connecting rods to cranks upon the shaft and axle *outside* of the wheels. This expedient of a separate shaft was adopted to obviate the damage that might occur to the spur and pinion from any jars or undulatory action of the road wheels, and since this engine was lighter than the Atlantic, and as much adhesive power would be needful in the traction of heavy trains upon the railway in the curves and ascents, it was furthermore deemed proper to avail of the adhesion of all the four wheels by means of outside cranks and connecting rods.

A great, if not a vexatious delay has been experienced in procuring these repairs although the work was confided to an establishment of good character and much business, but there is now a prospect of having it upon the road in the course of a very few days. The performance of this machine will be seen with much interest as it will test the advantage of several improvements which have been suggested and are introduced in its structure; the result will consequently have an important bearing upon the manner of arranging the working parts of the locomotive engines now about to be constructed.

It is not thought proper on the present occasion to travel over grounds heretofore occupied in the annual reports as regards the motive power and machinery, or to repeat what is said upon this subject, in my report upon the routes of the proposed railway to connect the cities of Baltimore and Washington, already referred to as a document annexed to *this* report: it may however be mentioned, that our confidence in the use of steel springs for the burthen cars as well as for the passenger coaches, remains unabated; and that this subject, in common with others of utility in railways and railway machinery, has continued to claim our especial care, and the result will probably be, the fabrication and adoption of steel springs entirely efficient and very durable, the prime cost of which inclusive of appurtenant fixtures shall not exceed the one third part of that of *leather braces*, or even of the springs of steel as hitherto made and used to sustain equal stress, elsewhere.

No extension of the rail road having been made within the year just closed, there will be nothing to offer under that head; and the lettings upon the first Division of the Washington rail road are of such recent occurrence as not to require from me in this place any special mention or detail.

In the transportation department there has been a constant accession of business, both as regards the quantity of commodities carried, and the number of passengers conveyed, and there is every just ground to expect a continuance of increase of revenue from these sources, and an adequate remuneration for the expenditures incurred. It is probable that this desirable result will be realized in a shorter time from the commencement of the undertaking than has been experienced in most public works in our country, that have nevertheless proved highly successful and profitable. Much credit is due to the Superintendent of Transportation, William Woodville, for his vigilence, and for the degree to which he has economised the expenses in the department committed to his care, and we are assured, that these expenses will by no means increase in the ratio of the increased receipts. In connection with this part of the subject is the economy of passing the planes at Parr's ridge, hitherto effected with horse power, by the usual manner of working that animal on other parts of the road. As the tonnage of the transit augments, the economy of this power over that of steam by fixed engines and the appropriate appendages, becomes more equivocal, and it is believed, that the time has nearly arrived when it will be proper to commence the erection of stationary engines. The transit over the Inclined planes by these will doubtless be performed in a cheaper and much more convenient manner than with horses, when the accession to the trade and intercourse consequent upon the extension of the rail road to Harper's ferry, shall be realized. Estimates and comparisons will be instituted by this department upon this subject, and in due time reported with the necessary plans.

With regard to the extension of the Baltimore and Ohio Rail Road from the Point of Rocks to Harper's ferry, it may be remarked that the Chesapeake and Ohio Canal Company, have located and are engaged in the construction of the graduation of the Rail Road through the narrow passes, comprising a distance of four and one-tenth miles in pursuance of the compromise entered into between the Canal and Rail Road Companies. A line of location for the rail road has likewise been traced and staked out under the directions of this department, by Caspar W. Wever, embracing the residue of the distance and equal to about eight and a fourth miles. This line met with my approbation, and was then submitted with the drawings to Alfred Cruger, Engineer and Commissioner on the part of the Canal Company, for his approval. After conference and deliberation he proposed certain alterations in the line to render it acceptable on his part; to these alterations I acceded. Having thus come to a mutual understanding in a written correspondence, which was duly reported by me to thee, and the arrangement having been approved and sanctioned by the Board, will doubtless be likewise approved by the Canal Board, when no obstruction will exist to a consummation of the compromise in a speedy construction of the work to Harper's ferry.

Surveys of the country between the city of Baltimore and the city of Washington, have been continued with a view to perfect the location of the route for a rail road to connect those cities, and drawings, calculations, and estimates of several of the most feasible routes have been made and were reported on the 27th July last, for a more full account in relation to which, see document W. R. annexed, and herein before referred to. The Board having decided in favor of the *upper route No. 2* as combining the most advantages for a railway, such as is proposed to be formed upon a line of intercommunication of so great importance, I have proceeded without delay in obedience to thy instructions to that effect to assign the definitive position of the line and stake it out for contract. The first division extending from the Baltimore and Ohio Rail Road to, and inclusive of Merrill's ridge, and the fourth division extending from a point near Bladensburgh to the boundary line of the city of Washington, both together about eleven miles were staked out for contract during the time of the pendency of the question with regard to a preference of the routes, these two divisions not having been involved in that question. In the execution of the final survey now mentioned, the first division has been much improved in its location by laying it upon ground requiring less masonry and much less excavation and embankment. The surveying party is now engaged upon the second and third divisions, comprising a distance of about eighteen miles, which will be prepared for contract in the course of a few weeks, or as soon as practicable. The surveys, levellings, drawings and calculations in relation to the routes for this rail road have been conducted under my direction by B. H. Latrobe, assistant Engineer, whose services have been faithfully rendered, and continue to be highly valuable.

Respectfully submitted,

J. KNIGHT,
Chief Engineer Balt. and Ohio Rail Road.

(W. R.)

Engineer's Office, Baltimore and Ohio
Rail Road Co. July 27th, 1833.

To Philip E. Thomas, Esq. *Prest. &c.*

I have the honor herewith to present a report in relation to the proposed rail road to connect the cities of Baltimore and Washington, containing, upon the different routes, estimates of the probable cost of the graduation, masonry and bridging, and of a double railway; and also of the probable cost of the repairs and renewals of the same respectively, together with the cost of the motive power and machinery: and further showing the relative feasibility and fitness of the several routes, for the proposed rail road.

This report is accompanied with a book of calculations of the quantities and estimates in detail of the probable cost of the graduation, masonry and bridging, and likewise with the maps and profiles of the several routes.

In the making of the surveys, drawings and estimates, I have been efficiently aided by B. H. Latrobe, Assistant Engineer; and with regard to the estimates of the masonry, by Robert Wilson, and of the machinery, by George Gillingham, Superintendent of Machinery. Respectfully submitted,

J. KNIGHT,
Chief Eng. Balt. & O. Rail Road.

Report of J. Knight, Chief Engineer, in relation to the proposed Rail Road between Baltimore and Washington.

The leading principles that should govern us in the location and construction of a rail road upon a route of such importance as that between the city of Baltimore and the city of Washington, have been already enunciated in a report predicated upon a reconnoissance of the country between the two cities, made January 22, 1831, relating to the proposed work, (see Fifth Annual Report, p. 91,) and in a report accompanied by an estimate of the probable cost of construction of the same, made February 17th, 1832, (see Sixth Annual Report, p. 57.) To these documents I would respectfully refer for a more full elucidation of my views and opinions in relation as well to the character of the enterprize as to the principles to be observed in relation to it. With the exception of observations incidentally made in the course of this report, touching the views and principles now alluded to, no repetition or re-assertion of them will here be formally made, further than to say that I continue to entertain the same views as heretofore expressed, and now referred to, and as I deem the success of this work to be essentially dependent upon their observance, the grades and curvatures have been regulated accordingly.

In the course of the examinations and surveys made to secure the best route, the face of the country has been traversed and minutely ascertained with the requisite instruments, to an extent that leaves no doubt of our having attained the object in view. The intervening ridges and water courses have been traced, and their levels taken to proper distances, to the right and left of a direct line, connecting the terminii of the proposed work, and all the routes indicated by these levels and distances, as well as those which, from a minute inspection of the country, were deemed feasible, were surveyed and compared. The result was that two principal routes, called the *upper* and *lower*, presented, in relation to which, it became necessary to institute the most minute surveys, and to lay the *alignements* in the best manner, in order that a comparison as to expense of construction, repairs, and motive power and machinery could be made without risk of error in determining a choice. In the course of those surveys, the lower route, in the vicinity of the Patuxents, became resolved into five different lines, each of which presented claims that merited minute investigation. These, with the upper route, made six in number, and as either of the six might be made to cross the Patapsco river, below Dennis A. Smith's bridge, or further up the stream at Hockley Mill, which lines likewise required a close and careful comparison, the number of practicable and feasible routes with regard to which equally strict estimates had to be made, was increased to *twelve.*

Without further preface, I now proceed to the calculations and comparisons, just alluded to, under the five following heads, viz:

I. Estimates of the probable cost of the graduation and masonry.

II. Repairs of the graduation and masonry.

III. Estimates of the probable cost of the railway, and of the repairs and renewals of the same.

IV. Motive power and machinery.

V. The comparison of the twelve routes.

I. *Estimates of the probable cost of the Graduation and Masonry.*

The estimates of the probable cost of construction have been made upon 12 different routes, all of which were carefully surveyed as being feasible, but in relation to which a judicious choice could not be made without the aid of precise calculations and estimates. These estimates are contained in a book that accompanies this report, and the results upon the 12 routes are respectively exhibited in table 1. hereunto annexed. This table likewise contains the estimates of the probable cost of the tracks of a double railway, and the total cost, &c. together with a column of references to the maps. It is not deemed necessary to encumber this report with the details of the estimates of graduation and masonry upon all the routes, but only upon two of them, between which, it is confidently believed the final choice will rest. The estimates upon those two routes are as follows:

1. Estimates of the graduation upon the upper route, No. 2 and upon the lower route, No. 12, both passing Hockley Mill.

First Division, commencing at the Baltimore and Ohio Rail Road, and ending at Merrill's ridge, about 1000 feet in advance of the point of deepest cutting in that ridge. This division is common to both routes.

1*st section*. *Length* 3765 *feet*.

c. *yds*.		*cts*.		$
2,514	at	18	=	452.52
15,488	rock	105	=	16,262.40
20,365	rock	103	=	20,975.96
14,745	rock	81	=	11,943.45
11,156	at	21	=	2,342.76
Clear. off tim.			=	50.00
64,268				$52,027.09
Deduct for supposed saving of rock exca. from shifting the line				10,000.00
				$42,027.09

3*d section*. *Length* 3,200 *feet*.

c. *yds*.		*cts*.		$
1,782	at	15	=	267.30
4,097	at	16	=	655.52
5,022	at	16	=	803.52
14,855	at	19	=	2,822.45
1,133	at	16	=	181.28
		Timber	=	100.00
26,889				4,830.07

5*th section*. *Length* 5564 *feet*.

c. *yds*.		*cts*.		$
5,832	at	20	=	1,166.40
10,611	at	17	=	1,803.87
867	at	16	=	138.72
101,058	at	31	=	31,327.98
		Timber	=	90.00
118,368				34,526.97

7*th section*. *Length* 6800 *feet*.

c. *yos*.		*cts*.		$
66,828	at	46	=	30,740.88
180,203	at	35	=	63,071.05
		Timber	=	437.50
247,031				94,249.43

2*d section*. *Length* 3200 *feet*.

c. *yds*.		*cts*.		$
14,090	at	25	=	3,522.50
22,159	at	21	=	4,653.39
		Timber	=	75.00
36,249				8,250.89

4*th section*. *Length* 6525 *feet*.

c. *yds*.		*cts*.		$
3,385	at	17	=	575.45
4,345	at	15	=	653.10
10,595	at	20	=	2,119.00
1,469	at	16	=	235.04
3,476	at	19	=	660.44
5,940	at	17	=	1,009.80
113,102	at	33	=	37,323.66
6,975	at	17	=	1,185.75
		Timber	=	125.00
149,296				43,887.24

6*th section*. *Length* 5500 *feet*.

c. *yds*.		*cts*.		$
36,164	at	25	=	9,041.00
15,234	at	20	=	3,046.80
5,318	at	16	=	850.88
9,442	at	20	=	1,888.40
6,776	at	16	=	1,084.16
		Timber	=	0.00
72,934				15,911.24

Recapitulation of 1st Division.

section.	*length ft.*	*c. yds. removed.*	*estimated cost.*
1	3765	64,268	$42,027.09
2	3200	36,249	8,250.89
3	3200	26,889	4,830.07
4	6525	149,296	43,887.24
5	5564	118,368	34,526.97
6	5500	72,934	15,911.24
7	6800	247,031	94,249.43
Totals	34,554	715,035	243,682.93

6 miles 2874 ft.=6.5443 miles. Average cost $34\frac{9}{100}$ cts. per c. yd.

Second Division. Upper route, commencing at Merrill's ridge, crossing the Patuxents, and ending just after passing Snowden's ridge.

1st section. Length 6500 *feet.*

c. yds.	*cts.*	$
28,548	at 21 =	5,995.08
897	at 13 =	116.61
3,195	at 32 =	1,022.40
6,038	at 18 =	1,086.84
1,493	at 15 =	223.95
6,000	at 15 =	900.00
24,723	at 21 =	5,191.83
	Timber =	99.00
70,894		14,635.71

2d section. Length 6100 *feet.*

c. yds.	*cts.*	$
8,094	at 16 =	1,295,04
237	at 13 =	30.81
3,369	at 17 =	572.73
37,482	at 20 =	7,496.40
89	at 13 =	11.57
	Timber =	140.00
49,271		9,546.55

3rd section. Length 5100 *feet.*

c. yds.	*cts.*	$
404	at 13 =	52 52
796	at 17 =	135,32
310	at 14 =	43.40
2,258	at 21 =	474.18
13,156	at 40 =	5,262.40
6,639	at 25 =	1,659.75
4,729	at 18 =	851.22
	Timber=	25.00
28,292		$8,503.79

4th section. Length 5900 *feet.*

c. yds.	*cts.*	$
152,868	at 47	71,847 96
7,339	at 30 =	2,201.70
	Timber=	273.00
160,207		$74,322.66

5th section. Length 7000 *feet*

c. yds.	*cts.*	$
74,207	at 54 =	40,071.78
32,878	at 30 =	9,863.40
	Timber =	335.00
107,085		$50,270.18

6th section. Length 11134 *feet.*

c. yds.	*cts.*	$
12,940	at 15 =	1,942.50
10,228	at 19 =	1,943.32
9,426	at 26 =	2,450.76
2,819	at 17 =	479.23
53,419	at 18 =	9,615.42
	Timber =	73.00
88,832		$16,504 23

7th section. Length 9800 *feet.*

c. yds. cts. $
1,850 at 13 = 240.50
252,625 at 32 = 80,848.00
8,747 at 28 = 2,449.16
———Timber= 325.00
263,247
$83,863.16

Recapitulation of second division, Upper Route.

Sections	*Length ft.*	*c. yds. to be removed*	*Estimated cost.*
1	6 500	70,894	$14,635.71
2	6,100	49,271	9,546.55
3	5,100	28,292	8,503.79
4	5,900	160,207	74,322 66
5	7,000	107,085	50,270.18
6	11,134	88,832	16,504.23
7	9,800	263,247	83,863.16
Totals =	51,534 7	67,828	$257,646.28

9 miles 4014 feet = 9.7602 miles. Average 33$\frac{55}{100}$ cts. per cubic yard.

Third division, Upper route, commencing near Snowden's ridge and terminating at the crossing of the Turnpike road near Bladensburgh, and at the intersection with the lower route.

1*st section. Length* 9500 *feet.*

c. yds. cts. $
7,552 at 27 = 2,039.04
6,238 at 18 = 1,122.84
4,640 at 19 = 881.60
274 at 17 = 46.58
392 at 13 = 50.96
112 at 12 = 13.44
3.709 at 16 = 593.44
——Timber = 133.00
22,917
$4,880.90

2nd section. Length 7200 *fcet*

c. yds. cts. $
1,227 at 15 = 184.05
1,847 at 16 = 295.52
1,171 at 17 = 199.07
5,158 at 19 = 980.02
6,147 at 21 = 1,290.87
———Timber = 0.00
15,550
$2,949.53

3rd section. Length 4700 *fect.*

c. yds. cts. $
22,423 at 24 = 5,381.52.
3,451 at 13 = 448.63
———Timber = 24.00
25,874
$5,854.15

4th section. Length 9354 *feet.*

c. yds. cts. $
2,377 at 13 = 309.01
7.462 at 18 = 1,343.16
11,088 at 22 = 2,439.36
9,722 at 21 = 2,041.62
———Timber = 218.00
30,649
$6,351.15

5th section. Length 4500 feet.

c. yds.	*cts.*		$
5,771	at 25	=	1,442.75
2,785	at 20	=	557.00
920	at 19	=	174.80
	Timber	=	100.00
9,476			$2,274.55

6th section. Length 7400 feet.

c. yds.	*cts.*		$
1,109	at 19	=	210.71
4,754	at 22	=	1,045.88
3,064	at 24	=	735.36
2,271	at 16	=	363.36
4,867	at 18	=	876.07
1,859	at 15	=	278.85
	Timber	=	45.00
17,924			$3,555.23

Recapitulation of Third division, Upper route.

Section.	*Length feet.*	*Cubic yards removed.*	*Estimated cost.*
1	9500	22,917	$4,880,90
2	7200	15,550	2,949.53
3	4700	25,874	5,854.15
4	9354	30,649	6,351.15
5	4500	9,476	2,274.55
6	7400	17,924	3,555.23
Totals =	42,654	122,390	$25,865.51

8 miles 414 feet = 8.0784 miles. Average cost $21\frac{13}{100}$ cents per cubic yard.

Fourth Division, common to both routes, commences at the crossing of the Turnpike road near Bladensburgh and terminates at the boundary line of town plot of the city of Washington.

1st section. Length 6723 feet.

c. yds.	*cts.*		$
161	at 13	=	20.93
1,580	at 20	=	316.00
31,907	at 30	=	9,572.10
115,611	at 27	=	31,214.97
	Timber	=	0.00
149,259			$41,124.00

2nd section. Length 8227 feet.

c. yds.	*cts.*		$
4,501	at 15	=	675.15
23,501	at 38	=	8,930.38
92,339	at 32	=	29,548.48
56,897	at 28	=	15,931.16
13,538	at 18	=	2,436.84
5,963	at 28	=	1,669.64
	Timber	=	145.00
196,739			$59,336.65

3rd section. Length 7900 feet.

c. yds.	*cts.*		$
11,307	at 21	=	2,374.47
2,905	at 22	=	639.10
31,488	at 24	=	7,557.12
453	at 15	=	67.95
8,218	at 20	=	1,643.60
	Timber	=	50.00
54,371			$12,332.24

Recapitulation of Fourth division.

Sections.	*Length feet.*	*Cubic yards removed.*	*Estimated cost.*
1	6723	149,259	$41,124.00
2	8227	196,739	59,336.65
3	7900	54,371	12,332.24
Totals =	22,850	400,369	$112,792.89
Deduct quantity carried to and estimated on Cy. division		8,502	1,686.20
		391,867	$111,106.69

4 miles 1730 feet = 4,3276 miles. Average cost $28\frac{171}{100}$ cents per cubic yard.

City division, common to both routes, extends from the city boundary to New Jersey avenue, within the city of Washington. Length 6000 feet. Estimate of which is as follows:

c. yds.	*cts.*		$
558	at 15	=	83.70
10,407	at 29	=	3,018.03
8,863	at 33	=	2,924.79
4,631	at 17	=	787.27
52,058	at 24	=	12,493.92
76,517			$19,307.71

1 mile 720 feet = 1.1364 miles. Average cost $25\frac{2}{00}^{3}$ cents per cubic yards.

Second division, lower route, commencing near Merrill's ridge and at the point of departure of the upper route, thence down Chandler's run and crossing the lesser Patuxent near Beall Duvall's mill, passing the ridge near the school house, and the greater Patuxent at Dr. Duvall's, thence by the intermediate route &c. called No. 12, passing Snowden's ridge, and terminating near Turner Belt's.

1st section. Length 6130 *feet.*

c. yds.	*cts.*		$
59,552	at 25	=	14,888.00
390	at 14	=	54.60
4,408	at 21	=	925.68
2,342	at 15	=	351.30
———	Timber	=	200.00
66,692			
			$16,419.58

2nd section. Length 10,000 *feet.*

c. yds.	*cts.*		$
34,138	at 17	=	5,803.46
13,193	at 18	=	2,374.74
———	Timber	=	636.00
47,331			
			$8,814.20

3rd section. *Length* 5212 *feet.*
c. yds. *cts.* $
28,174 at 29 = 8,170.46
1,946 at 15 = 291.90
33,330 at 22 = 7,332.60
———Timber = 45.00
63,450
$15,839.96

4th section. *Length* 7300 *feet.*
c. yds. *cts.* $
10,664 at 23 = 2,452.72
699 at 15 = 104.85
1,802 at 27 = 486.54
18,128 at 26 = 4,713 28
361 at 14 = 50.54
———Timber = 120.00
31,654
$7,927.93

5th section. *Length* 8200 *feet.*
c. yds. *cts.* $
3,930 at 17 = 668.10
7,803 at 20 = 1,560.60
35,377 at 38 = 13,443.26
35,087 at 24 = 8,420.88
———Timber = 265.00
82,197
$24,357.84

6th section. *Length* 8400 *feet.*
c. yds. *cts.* $
310 at 13 = 40.30
15,487 at 20 = 3,097.40
22,185 at 22 = 4,880.70
6,849 at 35 = 2,397.15
4,537 at 33.19 = 1,505.70
96,430 at 27 = 26,036.10
———Timber = 237.50
145,798
$38,194.85

Thence the 2nd division continues on the Intermediate route as follows:

7th section. *Length* 5582 *feet.*
c. yds. *cts.* $
78,827 at 35 = 27,589.45
3,869 at 20 = 773.80
9,075 at 30 = 2,722.50
19,212 at 40 = 7,684.80
———Timber = 75.00
110,983
$38,845.35

Thence the second division continues on the Mill route, as follows:

8th section. *Length* 3100 *feet.*
c. yds. *cts.* $
16,326 at $19\frac{57}{100}$ = 3,195.75
———Timber = 36.00
16,326
$3,231.75

This is part of 3rd section, mill route.

9th section. *Length* 4117 *feet.*
c. yds. *cts.* $
112,510 at 27 = 30,377.70
———Timber = 50.00
112,510
$30,427.70

This is section 4 of mill route

Thence the 2nd division continues by section 6th of the Clark route, thus:

10th section. Length 6800 *feet.*
c. yds. cts. $
9,960 at 18 = 1,792.80
7,312 at 27 = 1,974.24
12,098 at 31 = 3,750.38
4,668 at 16 = 746.88
2,713 at 27 = 732.51
———Timber = 0.00
36,751
$8,996.81

Recapitulation of second division, Lower route.

Section.		*Length feet.*		*Cubic yards removed.*			*Estimated cost*
1	-	6,130	-	66,692	-	-	$16,419.58
2	-	10,000	-	47,331	-	-	8,814.20
3	-	5,212	-	63,450	-	-	15,839.96
4	-	7,300	-	31,654	-	-	7,927.93
5	-	8,200	-	82,197	-	-	24,357.84
6	-	8,400	-	145,798	-	-	38,194.85
7	-	5,582	-	110,983	-	-	38,845.35
8	-	3,100	-	16,326	-	-	3,231.75
9	-	4,117	-	112,510	-	-	30,427.70
10	-	6,800	-	36,751	-	-	8,996.81
Totals =		64,841	-	713,692	-	-	$193,055.97

12 miles 1481 feet = 12.2803 miles. Average cost $27\frac{5}{100}$ cents per cubic yard.

Third division, Lower route, continues from a point near Turner Belt's to the intersection with the upper route at the crossing of the Turnpike road near Bladensburgh.

1st section. Length 8000 *feet.*
c. yds. cts. $
5,216 at 27 = 1,408.32
8,376 at 22 = 1,862.12
7,322 at 19 = 1,391.18
3,305 at 16 = 528.80
10,431 at 17 = 1,773.27
———Timber = 420.00
34,650
$7,383.69
And including the residue of section 6, *Clark route.*

2nd section. Length 11500 *feet.*
c. yds. cts. $
6,847 at 17 = 1,163.99
4,722 at 16 = 755.52
7,080 at 28 = 1,982.40
2,936 at 25 = 734.00
7,030 at 26 = 1,827.80
———Timber = 450.00
28,615
$6,913.71

3rd section. *Length* 9500 *feet.*

c. yds.	*cts.*		*$*
19,063	at 17	=	3,240.71
13,383	at 18	=	2,408.94
5,098	at 16	=	815.68
———	Timber	=	450.00
37,544			
			$6,915.33

4th section. *Length* 5500 *feet.*

c. yds.	*cts.*		*$*
1,333	at 19	=	253.27
16,215	at 24	=	3,891.60
1,177	at 17	=	200.09
———	Timber	=	120.00
18,725			
			$4,464.96

5th section. *Length* 7300 *feet.*

c. yds.	*cts.*		*$*
3,823	at 23	=	879.29
8,313	at 20	=	1,662.60
2,878	at 17	=	489.26
3;677	at 18	=	625.09
860	at 16	=	137.60
2,189	at 15	=	328.35
———	Timber	=	45.00
21,740			
			$4,167.19

Recapitulation of Third division, Lower route.

Section.	*Length feet.*	*Cubic yards removed.*	*Estimated cost.*
1	8,000	34,650	$7,383.69
2	11,500	28,615	6,913.71
3	9,500	37,544	6,915.33
4	5,500	18,725	4,464.96
5	7,300	21,740	4,167.19
Totals =	41800	141,274	$29,844.88

7 miles 4840 feet = 7.9166 miles. Average cost 21$\frac{13}{100}$ cents per cubic yard.

Recapitulation of the Upper Route, No. 2.

Division.	*Length miles.*	*c. yds. to be removed*	*estimated cost.*
1st.	6.5443	715,035	$243,682.93
2d.	9.7602	767,828	257,646.28
3d.	8.0784	122,390	25,865.51
4th.	4.3276	391,867	111,106.69
City.	1.1364	76,517	19,307.71
Totals	29.8469	2,073,637^{1}	$657,609.12

10 per cent. for contingencies and superintendence = 65,760.91

Total estimated cost of graduation = $723,370.03

Being an average of 69,476 cubic yards per mile, at an average cost of $24,236 per mile, and of 34$\frac{88}{100}$ cents per c. yard.

Recapitulation of the Lower Route, No. 12.

Division.		*length miles.*		*c. yds. to be removed.*		*estimated cost.*
1st.	-	6.5443	-	715,035	-	$243,682.23
2d.	-	12.2803	-	713,692	-	193,055.97
3d.	-	7.9166	-	141,274	-	29,844.88
4th.	-	4.3276	-	391,867	-	111,106.69
City	-	1.1364	-	76,517	-	19,307.71
Totals		32.2052	-	2,038,385	-	$596,998.18
10 per cent. for contingencies and superintendence =						59,699.82
Total estimated cost of graduation =						$656,698.00

Being an average of 63,294 cubic yards per mile, at an average cost of $20,391 per mile, and of $32\frac{22}{100}$ cents per cubic yard.

2. Estimates of the masonry and bridging upon the upper route, No. 2, and upon the lower route, No. 12, both passing Hockley Mill.

First Division, extending from Baltimore and Ohio Rail Road to Merrill's ridge, length 6.5443 miles, and common to both routes.

Character of structure	No of arches or openings	Span of arch and width and height of culvert	Height of roadway above water or ground.	No. of perches.	Price per perch.	Estimated net cost of structure.	Remarks.
		feet	feet		$	$	
bridge	8	58	66	20,000	6	120,000	Patapsco at Hockley mill.
culvert	1	4 by 4	27	230	3	690	
do	3	3 by 4	35	500	3	1,500	
bridge	2	20	11.5	600	6½	3,900	Washington turnpike road
culvert	1	3 by 4	19.5	120	3	360	
do	1	2 by 2	2.5	25	3	75	
do	1	4 by 4	23	180	3	540	
do	3	3 by 4	28	350	3	1,050	Scott's Folly branch.
do	1	3 by 4	15	74	3	222	
do	1	3 by 4	11	66	2½	165	
do	1	2 " 3	3	25	2	50	
bridge	1	20	47	3,500	6	21,000	Budd's run.
culvert	1	3 " 4	34	250	2½	625	Mill race.
do	1	3 " 3	17.5	92	2	184	
bridge	1	20	30	1,500	4½	6,750	Deep run.
culvert	1	2 " 2	13	44	2	88	
do	1	2 " 3	11	40	2	80	
do	1	2 " 2	4	24	2½	60	
do	1	2 " 2	15	50	2½	125	
do	1	2 " 3	12	64	2½	160	
do	3	3 " 4	22	250	3	750	Licking run.
Bridge, wood superstructure upon stone abutments, at Merrill's bridge				-	-	6,000	To pass Annapolis road over the rail road.
			Totals = perches	27,984	-	164,374	

Average $5.87½ per perch of 25 cubic feet.

Second Division, Upper Route, length 9.7602 miles.

Character of structure.	No. of arches or openings.	Span of arch and width and height of culvert.	Height of roadway above water or ground.	No. of perches.	Price per perch.	Estimated nett cost of structure.	Remarks.
		feet.	feet.		$	$	
culvert	3	3 by 4	2.7	140	$4\frac{1}{2}$	630	
bridge	1	20	16.3	537	$5\frac{1}{2}$	2,953	Chandler's run.
culvert	1	3 by 4	11	90	4	360	
do	1	2 " 3	9.5	38	4	152	
do	1	3 " 4	8	54	4	216	
do	1	2 " 2	2.4	25	2	50	
do	1	2 " 3	6.6	40	3	120	
bridge	1	50	36.7	4,400	5	22,000	Little Patuxent.
culvert	1	2 " 3	c. 5 ft.	25	4	100	
bridge	1	60	32	5,000	5	25,000	Great Patuxent.
culvert	6	3 " 5	22	538	4	2,152	Mrs. Snowden's meadow.
do	1	3 " 4	7	50	4	200	
do	2	2 " 3	c. 3 ft.	40	4	160	
do	3	3 " 5	10	180	5	900	
do	4	3 " 3	5	170	5	850	
Bridge of wood and stone similar to one at Merrill's ridge.				-	-	6,000	To pass Washington turnpike over rail road.
Totals = perches				11,327	-	61,843	ave. $5.46 per p.

Third Division, Upper Route, length 8.0784 miles.

Character of structure	No. of arches or openings	Span of arch and width and height of culvert.	Height of roadway above water or ground.	No. of perches.	Price per perch.	Estimated nett cost of structure.	Remarks.
		feet.	feet.		$	$	
bridge	1	8	8	175	6	1,050	Br. of Piney run.
do	1	8	8	175	6	1,050	do
do	1	8	8	175	6	1,050	do
culvert	1	3 by 4	6	69	$4\frac{1}{4}$	238	
do	2	3 " 5	12	154	$4\frac{1}{2}$	693	
do	2	2 " 3	5	53	4	212	
do	2	3 " 5	12.7	160	$4\frac{1}{2}$	720	
bridge	2	50	8	365	$5\frac{1}{2}$	2,007	Paintbranch; being stone work to support a wooden superstructure, the height being too low for stone arches
do	1	6	6	200	$5\frac{1}{2}$	1,100	
do	1	10	12	220	$5\frac{1}{4}$	1,155	
culvert	1	2 " 2	10.5	62	4	248	
do	1	2 " 3	9	38	4	152	
do	1	2 " 3	9	38	4	152	
do	1	2 " 3	9	38	4	152	
do	1	3 " 4	19	160	4	640	
Add for wooden superstructure over Paint branch.				-	-	1,380	
Totals = perches				2,068	-	11,999	ave. $5.80 per p.

Fourth Division, common to both routes, length 4.3276 miles.

Character of structure	No. of arches or openings.	Span of arch and width and height of culvert.	Height of railway above water or ground.	No. of perches.	Price per perch.	Estimated nett cost of structure.	Remarks.
		feet.	feet.		$	$	
bridge	1	50	33	3,900	5¼	20,475	Northwest bran.
culvert	2	3 by 4	21	253	4	1,012	Mill race.
bridge	1	12	28	1,000	5¼	5,250	Duel run.
culvert	1	3 " 4	14	125	4	500	
do	1	3 " 4	7	50	4	200	
bridge	1	8	16	320	5½	1,760	
culvert	1	3 " 4	6	56	4	224	
do	1	3 " 4	8.7	72	4	288	
do	2	3 " 4	10	160	4	640	
bridge	1	10	5.3	210	5	1,050	Branch of Tiber.
culvert	1	2 " 2	1.5	24	3½	84	
Totals = perches				6,170	-	31,483	ave. $5.10¼ per p.

City Division, common to both routes, length 1.1364 miles.

Character of structure.	No. of arches or openings.	Span of arch and width and height of culvert.	Height of railway above water or ground.	No. of perches.	Price per perch.	Estimated nett cost of structure.	Remarks.
		feet.	feet.		$	$	
culvert	1	3 by 4	14	124	3½	434	
bridge	1	20	21	1,200	5	6,000	Tiber creek.
Totals = perches				1,324	-	6,434	ave. $4.86 per p.

Second Division, Lower Route, Length 12.2803 miles.

Character of structure.	No. of arches or openings	span of arch or width and height of culvert	Height of roadway above water or ground	No. of perches	Price per perch	Estimated net cost of structure	Remarks.
		feet	feet		$	$	
culvert	3	3 by 4	2	140	4½	630	Iglehart's branch
bridge	1	10	8	220	6	1,320	Tribut's of Chandler's br.
do.	1	50	27.6	3,500	6½	22,750	Little Patuxent
culvert	1	3 by 4	7.5	60	4½	270	
bridge	1	10	10.5	300	5½	1,650	Gaither's run
culvert	1	2 " 3	3	25	4½	112	
bridge	1	8	16.6	320	5½	1,760	
do.	1	6	12	254	5½	1,397	
culvert	1	2 " 3	3	25	4	100	
bridge	1	60	32	4,600	6½	29,900	Great Patuxent
culvert	1	2 " 2	surface	24	3½	84	
do.	1	2 " 3	5	35	4	140	
do.	2	3 " 5	13	160	4	640	
do.	1	2 " 3	8	40	3½	140	
do.	1	3 " 4	3	45	4	180	
bridge	1	10	13	300	5	1,500	Road S. W. of Z. Duval's
Total = perches				10,048		$62,573	avdge. $6.22¾ per p.

Third Division, Lower route, length 7.9166 miles.

Character of structure	No. of arches or openings	Span of arch or width and height of culvert	Height of roadway above water or ground	No. of perches	Price per perch	Estimated net cost of structure	Remarks.
		feet	feet		$	$	
bridge	3	50	8	471	5½	2,590	Paint branch; stone work for superstructure of wood, the height being too low for stone arches. As the water of Piney run is to be conducted and passed here, one additional span is added for that purpose.
do.	1	6	6	200	5½	1,100	
do.	1	10	12	220	5¼	1,155	
culvert	1	2 by 2	10.5	62	4	248	
do.	1	2 " 3	9	38	4	152	
do.	1	2 " 3	9	38	4	152	
do.	1	3 " 4	19	160	4	640	
do.	1	2 " 3	9	38	4	152	
Add for wooden superstructure on Paint branch				-	-	2,028	
Total perches =				1,227		$8,217	average $6.70 per p

Recapitulation of the Upper route, No. 2.

Division.	*Miles.*	*Perches.*	*Price per perch.*	*Estimated cost.*
1	6.5443	27,984	$5.87½	$164,374
2	9.7602	11,327	5.46	61,843
3	8.0784	2,069	5 80	11,999
4	4.3276	6,170	5.10¼	31,483
City	1.1364	1,324	4.86	6,434
Totals	29.8469	48,873	5.65	$276,133
For superintendence and contingencies 10 per cent. =			. 56½	27,613.30
Total estimated cost of masonry =			$6.21½	$303,746.30

Excluding, however, the estimated cost of a wooden bridge over the rail road at Merrill's ridge, of a similar one at Snowden's ridge, and of the woodwork at Paint branch, amounting altogether to $13,380 *plus* 10 per cent, the cost of the net quantity of masonry averages at $5.91½ per perch.

Recapitulation of the Lower route, No. 12.

Division.	*Miles.*	*Perches.*	*Price per perch.*	*Estimated cost.*
1	6.5443	27,984	$5.87½	$164,374
2	12.2803	10,048	6.22¾	62,573
3	7.9166	1,327	6.70	8,217
4	4.3276	6,170	5.10¼	31,483
City	1.1364	1,324	4.86	6,434
Totals	32.2052	46,753	5.84	273,081
For contingencies and superintendence 10 per cent =			58½	27,308.10
Total estimated cost of masonry =			$6.42½	$300,389.10

Excluding $8,028 *plus* 10 per cent being the estimated cost of a wooden bridge over the rail road at Merrill's ridge, and of the wooden superstructure at Paint branch, the cost of the net amount of masonry just given, will be $6.23½ per perch.

Estimated cost of both the graduation, masonry and of a double railway inclusive of contingencies and superintendence, upon the Upper route, No. 2. viz:

Graduation, 2,073,637 cubic yards, at $34\frac{88}{100}$ cents =	$723,370.03
Masonry 48,874 perches at $6.21½ =	303,746.30
Total for graduation and masonry =	$1,027,116.33
Double Railway, 29.8469 miles at $14,500 per mile =	432,780.05
Total estimated cost of rail road =	$1,459,896.38

The same as estimated upon the Lower route, No. 12 inclusive of contingencies and superintendence, will be, viz:

Graduation, 2,038,385 cub yds at $32\frac{22}{100}$ cts. =	$656,698.00
Masonry, 46,753 perches at $6.42½ = - -	300,389.10
Total of graduation and masonry = - -	$957,087.10
Double railway, 32.2052 miles at $14,500 per mile = - - - - - -	466,975.40
Total estimated cost of rail road = -	$1,424,062.50

Comparison of the estimates now presented with those reported in the last year.

Until the present time the only estimates exhibiting the probable cost of the contemplated rail road to Washington based upon surveys made by this Company and presented by me, other than the foregoing, were those reported on the 17th February, 1832, and contained in document H. I. page 63 of the 6th Annual Report, of the Baltimore and Ohio Rail Road Company, and amounting to $1,555,529.47. The estimate here mentioned includes the 10 per cent allowance for contingencies and superintendence, and putting the statement in the form of those now presented it will stand as follows, viz:

Estimate of the 17th February, 1832.

Graduation, 2,406,761 cubic yds. at $35\frac{62}{100}$ cts. =	$857,469.97
Masonry, 38,737 perches, at $6,79 = -	263,059.50
Total of graduation and masonry = -	$1,120,529.47
Double railway, 29 miles at $15,000 per mile =	435,000.00
Total estimated cost of rail road = - -	$1,555,529.47

But this estimate extends only to the boundary line of the city of Washington, whereas the estimates now reported extend into the city grounds a distance of $1\frac{1364}{10000}$ miles to New Jersey

Avenue. This extension is called the "city division" and has been estimated to cost (inclusive of 10 per cent) as follows, viz:

City Division.

Graduation, 76,517 cubic yds at $27\frac{3}{4}$ cents =	$21,238.48
Masonry 1,324 perches at $\$5.34\frac{1}{2}$ = - -	7,077.40
Double railway, 1.1364 miles at $14,500 per mile=	16,477.80
	$44,793.68

The route now reported as upper route No. 2, coincides very nearly with that estimated and reported on the 17th February 1832 excepting that it crosses the Patapsco at Hockley mill; and to make the comparison, it will be necessary to deduct from it the estimates of the City division: then,

Amount of estimate upon the upper route No. 2=	$1,459,896.38
do. of do. upon city division of the same =	44,793.68
Estimate of route No. 2, now reported, to Washington city boundary - - =	$1,415,102.70
estimate of route reported 17th Feb. 1832 =	$1,555,529.47
Difference in favor of the route *now* reported =	$140,426.77

In the estimate now presented, however, the two railway tracks are estimated to cost $14,500 per mile, whereas in the estimate of February 17th 1832, the estimate was $15,000. Therefore to make a correct comparison that shall show the advantages of one line over the other, this part of the estimate should be alike in both, and the following will be the estimate of route No. 2 excluding the city division.

Graduation 1,997,120 cub. yds. at $35\frac{16}{100}$ cts. =	$702,131.55
Masonry 47,550 perches, at $6.24 =	296,668.90
Total for graduation and masonry, =	$998,800.45
Double railway 28.7105 miles at $15,000 per mile, =	430,657.50
Total estimated cost of railroad to city boundary, =	$1,429,457.95

In the estimate of Feb. 17th, 1832, the average cost of the graduation is $35\frac{62}{100}$ cents per cubic yard, but in the estimate now made upon route No. 2, it is $35\frac{16}{100}$ cents. It was conceived that the price per yard, should be less in the latter than in the former estimate, as the distance of transportation, was, in some instances, made shorter. If however, the rate should remain the same, we have to add to the last preceding amount, the cost of 1,997,120 cubic yards at the difference of price, or at $\frac{46}{100}$ of a cent per yard, equal to $9,186.75

Comparative estimate of upper route, No. 2, from Baltimore and Ohio rail road, to Washington city boundary, = $1,438,644.70
Estimate of the same, as reported February, 17th, 1832, = $1,555,529.47

Difference gained by a judicious re-location, = $116,884.77

By adopting the crossing of Patapsco, which presented at Hockley Mill, an addition was made to the quantity of masonry of 9,480 perches, but not very much to its expense, on account of the far greater feasibility of the site for the bridge at that place: and notwithstanding the presence of a considerable quantity of rock in the line of the excavations there, yet the lessening of the excavation and removal of earth 100,775 cubic yards below the amount that would have been required, if the lower crossing had been adopted, rendered the route by Hockley Mill much the cheapest. Beyond the junction of the routes by Hockley Mill and by Smith's bridge, and principally on the 2d, 3d and 4th divisions, other savings to the amount of 308,866 cubic yards in the quantity of earth to be excavated and removed or supplied, were effected; so that the whole quantity, which at first was 2,406,761 cubic yards, became reduced to 1,997,120 cubic yards, being a saving of 409,641 cubic yards, and which will result in a diminished expenditure in the construction, of at least 116,884.77, as above stated; and it is confidently believed, that in the process of staking out the line for contract, a still further reduction in the expense of graduation will be realized.

Whilst it is believed that the entire cost of construction will not vary very materially from the amount now presented; yet circumstances may conspire to increase it to some extent; the price of labor may rise, the quantum of masonry in a few instances may possibly be increased; the foundations may in some cases be more difficult to procure than is apprehended; and unexpected difficulties may attend some of the extensive excavations; but we cannot conceive it to be probable, that such causes will exist, or be combined to an extent sufficient to reach the amount of the estimate heretofore made and presented on the 17th Feb. 1832, and upon which the proceedings of the Legistature and of the Company, in relation to this important work have been predicated. Whatever may be the precise ultimate cost, however, we know that in the re-location, the line has been amended to the extent already mentioned, and that the final actual cost, will be lessened at least the sum of $116,884.77, because the quantum of work to be performed, is reduced in a corresponding proportion.

Previously to giving the estimates for the construction and repairs and renewals of the railway, upon the several plans considered most feasible, we shall now enter upon a discussion and estimates, of the probable cost of the repairs of the graduation and masonry.

II. Repairs of the Graduation and Masonry.

1. *Extraordinary Repairs.*

The repairs of the graduation will be resolved into two parts, denominated "extraordinary" and "ordinary." It is found that embankments of earth subside to stability in the course of about five years, during which period they will have shrunk, or lost about one-tenth part of their first volume. The most of this shrinking will take place within the first and second years. It is true that the quantity of settling in an embankment, after it shall have been formed, will depend upon the quality of the component materials, the method and length of time employed in the construction, and the prevalent state of the weather during the process. At the same time considering the quality of the materials, that will doubtless be found to prevail on the line in question, and that the work will probably be constructed speedily, it is believed that the texture and degree of density, will be such as to render the embankments liable to suffer a loss of one-tenth of their cubic contents within a period of five years after they are received from the hands of the contractor.

The supply of earth for the restoration of the embankments will be furnished from the ditches and banks in the cuts, and conveyed in cars upon the railway to the place of deposit: Thus, at the same time that the primitive dimensions of these mounds are restored, the ditches and excavations will become widened and improved, and the banks more sloping and stable.

The whole of the earth required to raise the embankments to the height from which they may have subsided, and likewise to maintain their proper width, should be supplied from the ditches and cuts upon the line of the rail road; for otherwise there will be a want of economy, since whilst their slope, as at first formed, will be 1½ horizontal to 1 perpendicular, that of the banks of the excavations, will be only 1 to 1: a slope too steep for stability in common earth, but allowed to be so for the purpose of supplying materials for the "extraordinary" repairs of the embankments; an arrangement, which it is believed will attain the end desired, that is a perfect graduation of the road, at the least possible ultimate expenditure of capital.

Where embankments are of rock, no "extraordinary" repairs are needed, therefore when the materials are partly of earth, and partly of rock, repairs of this description will be restricted to the parts only that are of earth.

The earth may be transported with facility for considerable distances upon the railway, yet as some of the cuts, from the occurrence of slips and other causes may furnish a greater supply than for the time being may be wanted at the contiguous embankments, and as the cuttings are in some places redundant, and therefore their contents are to be thrown into spoil banks, it may be proper, for abundant caution, likewise to add to the "extraordinary" repairs of embankments, an estimate equal to one-tenth of the mass of the redundant excavations, to be made in the same five years.—Consequently the *extraordinary repairs* will consist of the removal of a quantity of earth equal to one-tenth of the entire mass removed and supplied in the construction of the graduation upon the several routes respectively, first deducting from the quantities upon routes No. 2, 4, 6, 8, 10, 12, the sum of 26,000 cubic yards, being the probable quantity of rock, that will enter the embankments, from the cuts near the Hockley mill. It is not certain, nor indeed is it scarcely probable, that rock will be found in the excavations upon any other part of either of the routes.

It is assumed that the excavation and removal of the earth in making these repairs will cost 25 cents per cubic yard, and 10 per centum of the amount will be added to cover contingencies and any additional superintendence that may be required, beyond what will be necessary in conducting the "ordinary repairs." One of the sources of expense will be the raising of the track of railway to the proper level during the progress of the repairs of the first five years; but it is believed that the estimates are competent to meet this, as well as all other expenditures connected with these repairs.

Upon the foregoing principles the calculations of the *extraordinary* repairs will be as follows:

No. 1. *Upper Route by Smith's Bridge.*

	cub. yds.	
Total mass of earth to be removed =	2,174,412	
One-tenth of which is equal to	217,441	
At 25 cents per cubic yard the amount is =		$54,360
Add 10 per cent for contingencies, &c. -		5,436
Total cost of 30.2021 miles at $1980 per mile		$59,796

No. 2. *Upper Route by Hockley Mill.*

	c. yds.	
Total mass of earth and rock to be removed	2,073,637	
Deduct the amount of rock - -	26,000	
Earth, - - - - -	2,047,637	
One-tenth of the mass of earth is -	204,764	
At 25 cents per yard, the amount is - -		$51,191
Add 10 per cent for contingencies, &c. -		5,119
Total cost of 29.8469 miles at $1,887 per mile		$56,310

In the same manner the calculations have been made upon the ten other routes, and the results of the estimates of the "extraordinary" repairs, in relation to the twelve routes are stated in the accompanying table, No. 2.

Notwithstanding these repairs are supposed to be continued through a period of five years from the first completion of the graduation; yet as the major part of the expense will be incurred in the earlier half of the time, and as the expense of the moving power to be employed in the general transit upon the railway may be somewhat enhanced during that time from unavoidable imperfections in the grades, and from possible occasional retardations in the movement of the trains, that may result from the operations in conducting these repairs; it is deemed most judicious, not to make any discount for time, but to consider the total estimated cost as so much present money.

Masonry. The masonry should be so well constructed as not to require any material repairs for a long period of time, and the estimates are intended to be for work of this character. No "extraordinary" repairs for the first five years, will therefore be estimated with regard to the masonry; an item will however be introduced into the estimates for *ordinary* repairs, competent, it is believed, to maintain the masonry and bridging in a state of preservation.

2. *Ordinary Repairs.*

Having estimated the repairs denominated *extraordinary*, we shall now endeavour to render an approximate estimate of those styled *ordinary.* The ordinary repairs will be annual in perpetuity, commencing with the completion of the Construction, and their amount will be nearly proportional to the quantities employed in the formation of the graduation and masonry.—The embankments will deteriorate from atmospheric influence, and the action of rains and thaws. The sloping banks of the excavations being likewise subject to the action of the same agents, will continue to disengage from their surfaces quantities of earth, that on occasions of rain, and of melting snows, will descend into the ditches. From the ditches, this earth must be raised and carried to repair the waste of the embankments. Should this earth be redundant, what remains after repairing the embankments, will be thrown away, or which would be better, distributed in excess along the slopes of these artificial mounds, in order to add to their strength and durability; but if the quantities furnished from the ditches, shall not be sufficient to complete the restoration of the embankments, then the quantity in defect, must be obtained from the most accessible grounds, or otherwise from the banks of the excavations, by which last expedient the cuts will be widened, and the works still further improved.

These operations will constitute the ordinary annual repairs of the graduation, to commence with the completion of the Construction, and to continue for an indefinite period of time.

Whilst the impossibility of assigning the exact amount of these repairs, is fully acknowledged, and the intrinsic difficulty of forming a close proximate estimate, will be conceded, yet it is believed, that an estimate may be made, which will not deviate widely from the reality, as it shall be found to obtain, in relation to the annual repairs of the graduation.

In my report to thee dated 5th March, 1832, and printed in Doc. No. 101, H. R. 1st session, 22d Congress, amongst other estimates, there is one for the ordinary annual repairs of a rail road of medium expense, and involving about 25,000 cubic yards, of embankment per mile. On page 208 of that Doc. these repairs are set down at $185 per mile, including an allowance for superintendence, and for occasional current repairs, or adjustments of the railway, such as is there described. Now deducting $50 for superintendence, and $25 for the current repairs and adjustments (exclusive of renewals and materials) of that description of railway, and the residue $110 per mile, will be the estimated cost of the repairs, of the graduation of the description of road there contemplated. But since the quantity of embankment on the rail road now under consideration, will be 2½ times that estimated for in Doc. 101, the cost of repairs on the road to Washington, would therefore probably be 2½ times $110, equal to $275; to this add $50 for superintendence, which will be nearly the same in amount in both cases, and we have for the annual repairs of the graduation of the Washington rail road, $325 per mile.

This estimate derives the cost of repairs from the comparative quantity of the embankments, supposing that the earth for their support will be wholly obtained from the ditches in the excavations, by which means, the latter will likewise be repaired, a circumstance that probably will be often realized. Upon a line however, where regarding such works in general, the quantity of excavation is comparatively great, as is the case with respect to the proposed railroad between Washington and Baltimore, we should prefer to found the calculation of the probable amount of the annual repairs of the graduation, upon the cost of cleaning the ditches and repairing the cuts, and to assume that the earth so obtained, would extend an equal length of road upon the embankments. Several miles in length of embankment of very moderate height, and remote from the greater cuttings, will remain to be estimated for separately, and will require repairs to a very small comparative amount. It remains to adopt a rule that shall apply to the repairs of the cuts throughout the line, and upon each route. We shall endeavour to draw this rule, from the circumstances attendant upon the repairs of the cuts on the first seven miles of the Baltimore and Ohio rail road, embracing ground nearly similar in character to that upon the line to Washington.

The supervisor of repairs, has estimated the probable cost of ordinary repairs during the ensuing year, in the four principal cuts; namely, at Mount Clare, 2d section; Deep Cut, and Vinegar Hill, as stated below; the two former being much out of repair, at the commencement, and the two latter being supposed in good repair—the respective depths, and lengths of these cuts, as well as the estimated cost of repairs, will be stated as follows:

1. Mount Clare cut,	depth	30 ft.	length	1972 ft.	repairs	$400
2. Cut on 2d section		40	do	1650	do	350
3. Deep Cut,		68	do	3000	do	600
4. Vinegar Hill,		50	do	1628	do	250
					Total,	$1600

The 1st and 2d being out of repair, the estimates for them are proportionally too high for the 3d and 4th. We shall nevertheless assume the total amount for the four cuts, as being the actual cost, and will form a rule that shall distribute the amount between them, in proportion to their respective dimensions of depth and length, for since the cut at Vinegar Hill, on account of the greater tenacity of the earth, has been the least expensive in repairs, in proportion to its depth and length, and that at Mount Clare the most expensive, according to its dimensions; hence, the average of all the cuts, will give a very good general average approximate rule for cuts through grounds of similar formation.

The quantity of deposite in the ditches, from banks of excavation of equal slope and of similar material, will, under the same meteorological circumstances, be very nearly proportional to the areas of the faces of the banks, and the areas will be nearly proportional to the products of the slant depths, multiplied into the lengths respectively. This would be rigidly so, if the longitudinal sections were triangles, and if they shall not be triangles, but of nearly similar figures, the products will still be very nearly as the areas. But the perpendicular depths are as the slant depths, therefore the products of the perpendicular depths by the lengths, are nearly as the areas, or as the quantities of deposit, or finally, as the expense. But if we take as standards of measure the four cuts mentioned, varying in form as they do, to the extent perhaps of most cuttings, we shall, by comparing the products of their depths and lengths, with the expense of their annual repairs, obtain a rule that will necessarily contain a proximate correction for their variation from proportion in length, depth, and curvature of profile, and consequently, that will converge sufficiently *near to exactness in estimates of this kind.*

	Depth.		Length.		Proportional area.
Then 1. Mount Clare cut,	30	×	1972	=	59.160
2. Cut on 2d section,	40	×	1650	=	66,000
3. Deep Cut,	68	×	3000	=	204,000
4. Vinegar Hill,	50	×	1628	=	81,400
					410,560

Therefore to obtain the value of the unit of proportional area for the four cuts, the whole cost being $1600, it will be,

410,560 : 1 : : $1600 : $.0039

And $\frac{39}{100}$ of a cent, becomes a constant multiplier in estimates of repairs for all cuts. Then if the banks of the four cuts were all of similar tenacity, the total cost $1600, would be proportioned as follows:

				$		$
1. Mount Clare,	proportional area	59,160	×	. 0039	=	231
2. 2d section cut,	do	66,000	×	. 0039	=	257
3. Deep cut,	do	204,000	×	. 0039	=	795
4. Vinegar Hill,	do	81,400	×	. 0039	=	317
		Total amount,			=	$1600

From the difference of tenacity in the material, the actual cost of repairs, will, however, have a different measure compared with the unit of area of the several cuts. The estimate for Mount Clare is the greatest, and if we deduct 25 per cent from the estimate for once putting the cut in good repair, the remainder being $300 will be the cost of repair for a year, and 59,160 : 1 : : $300 : $.005 = the cost per unit of area, for the cut at Mount Clare.

Again the estimate per annum for the cut at Vinegar Hill, already in good repair, is $250. Therefore 81.400 : 1 : : $250 : $.003 = the cost per unit of area for the cut at Vinegar Hill.

The ratio of cost for these four cuts, does therefore vary from $.003 to $.005 per foot of proportional area, the mean of which is $.004, or more exactly, as before calculated, it will be $.0039. In estimating the probable cost of the annual repairs, after the lapse of the first five years, of any particular cut made in a district of country of the kind of formation existing here, being of sand, gravel, and clay, variously combined, the cost per foot unit of area, as already defined, will be assumed at from $.003 to $.005, according to the supposed, or ascertained tenacity of the earth, or materials constituting the banks. For the purpose of general estimates however, it may be as well to employ the mean of $.0039.

Viewing the contour and other indications at the surface upon the lines, run for the rail road to Washington, it is inferred that the constituent materials of the excavations to be made upon the 1st, 4th and *city* divisions, will be similar to those encountered in forming the first seven miles of graduation for the Baltimore and Ohio rail road, and that those upon the 2d and 3d divisions of either of the routes, will be found to differ only in containing a greater proportion of sand, and perhaps of gravel. The cut through Snowden's ridge upon the upper route, and that at Dr. Duvall's upon the lowermost route, will, however probably be exceptions, as they may be of the more tenacious kind, having more of clay and less of sand. Finding it impossible from a bare reconnoissance of the surface to infer, with a certainty that shall not err, the proportions of the constituents, clay, gravel, and sand, upon which the precise ratio of expense will depend, and believing that the rigid application of the average ratio throughout, will be as near an approximation to what will really take place in effecting these repairs, as would that of any assumed varying ratios, we shall decide this complicated branch of the subject, by employing in the calculations that follow, the average ratio, $.0039 per unit of area.

It may be proper here to remark, that these calculations are based on the probable cost of the repairs of four cuts, during the 5th year after their formation, whereas we set out with the view of estimating the annual repairs after the end of five years. The results may consequently be supposed rather too high, but as there should not be much difference in the amounts of the ordinary repairs for the 5th and 6th years from the commencement, and as the foundation of the calculation partly rests upon estimate, we shall make no deduction on the account mentioned, but on the contrary, for greater caution, will assume that the *ordinary*, as well as the *extraordinary* repairs, shall commence as soon as the graduation and masonry shall be completed. Although in actually conducting the repairs, no distinction may exist for the first 5 years,—neverthless the two kinds of repairs may by calculation theoretically, always be separated in amount to an approximate degree of exactness, sufficiently near for any desirable purpose. We shall add to the estimate of ordinary repairs, about $50 per mile, per annum, or more exactly, $1500 per annum for superintendence upon each route, on the supposition, that this a sum adequate to procure the requisite degree of attention in the department of repairs.

Masonry. It is assumed that the masonry will be composed of imperishable materials, and as has been mentioned, that the workmanship will be good, yet as in the course of time, some repairs must be made, we shall suppose an average annual outlay of the half of one per centum of the estimated cost of construction, to be sufficient. Thus the calculation as regards the masonry for the *Upper Route by Hockley Mill* will be as follows:

Masonry, estimated cost, net = . .	$276,133
10 per cent for contingencies, &c. = .	27,613
Amount of estimate for construction = .	$303,746

The half of one per cent. upon which is = $1518.73, which is assumed to be the amount of the annual repairs. If this annuity be improved at 5 per cent. per annum, compound interest, it willl amount in 50 years to $317,943, a sum exceeding the estimated cost of the whole of the masonry.

The following estimates of the ordinary repairs upon the several routes, are made in accordance with the principles hereinbefore mentioned.

Estimate of Annual Repairs of Graduation.

1. Upper Route by Smith's Bridge.

First Division.

	Depth ft.	*Length ft.*	
Cut entering valley of Deep run,	40 ×	1200=	48.000
Hammond's Hill,	60 ×	1700=	102.000
Merrill's ridge in part	50 ×	4400=	220.000
Lesser cuts more than 15 ft. deep average,	18 ×	2200=	39.600
Cuts from 15 ft. deep to nothing, average,	7 ×	8100=	56.700

$
466.300×.0039=$1818.57

Distance 6.8994 miles.

Upper Route by Smith's Bridge.

Second Division.

Residue of Merrill's ridge, -	50 ×	2000=	100.000
Cut near N. Dorsey's	16 ×	2300=	36.800
Ridge bet'n Patuxents	54 ×	5500=	297.000
Cut near Snowden's r.	20 ×	2700=	54.000
Snowden's ridge,	40 ×	7000=	280.000
Cuts of 15 and under 15 feet deep	7 ×	6800=	47.600

815.400 ×$.0039=$3180.

Distance 9.7603 miles.

Upper Route by Smith's Bridge.

Third Division.

There are no cuts of a depth so great as 15 feet on this division.

Therefore average 5 × 13200 × $.0039 -	$257.40
3.0784 miles of embankment not repaired from the ditches of the excavations, at $50 per mile =	153.92
	$411.32

Distance 8.0784 miles.

Upper Route by Smith's Bridge.

The 4th and City Divisions.

	Depth. Length.	
Cut near Duel run,	27 × 1200=	32,400
Summit cut near District line - -	40 × 4000=	160,000
Cuts 15 feet deep	15 × 3900=	58,500
Cuts less than 15 ft. deep and to the city boun.	7 × 2800=	19,600
City division -	7 × 1200=	8,400
		278,900 × .0039 = $1087.71

4th division	=4.3277	miles.
City division	=1.1373	,,
	5.4640	"

SUMMARY.

1st division	6.8994	miles.	Repairs of Graduation		$1818.57
2d do	9.7603	"	do	do	3180.06
3d do	8.0784	"	do	do	411.32
4th & city divi.	5.4640	"	do	do	1087.71
	30.2021	miles ave. $218.45 per mile			$6497.66

Add ½ per cent per annum on $280,525 the estimated cost of masonry on this route, equal to $46.44 per m.	1402.44
Add for superintendence $1500 per annum, being per mile, $49.67, - - - - -	1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile, $314.56,	9400.10
Equivalent capital, per mile - -	$5,243
And for the whole route - -	$156,668

2. Upper Route by Hockley Mill.

Considering that upon the first division of this route, the length of new road to be constructed, and kept in repair will be shorter, than upon the route passing Smith's bridge, by 1875 feet, and that there is calculated to be about 100,000 cubic yards less of embankment upon the former than upon the latter, whilst 26,000 cubic yards of the embankment of the route by Hockley Mill will probably be of rock, and further that the command of the grade upon the route, is such, that in the revision of the line for contract, it may be run, so as to require less repairs, than if made upon the line as at present laid. Wherefore the repairs of the graduation upon the route by Hockley Mill will probably be about $300 per annum less than upon the route by Smith's Bridge.

SUMMARY.

6.5443	miles,	1st division,	repairs of	graduation,		$1518.57
9.7603	do	2d	do	do	do	3180.06
8.0784	do	3d	do	do	do	411.32
5.4640	do	4th and city divisions			do	1087.71

29.8470 miles, average $207.65 per mile, =	$6197.66
Add ½ per cent per annum on $303,746, the estimated cost of masonry on this route, equal to $50.88 per m.	1518.73
Add for superintendence $1500 per annum, being per mile, $50,25, - - - -	1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile, $308.78	$9216.33
Equivalent capital per mile, - -	$5,146
And for the route, - - -	$153,606

Estimate of annual repairs of graduation, Lowermost Route.

SECOND DIVISION.

	Depth ft. Length ft.	
Residue of Merrill's ridge -	50×3000 =	150,000
Cut near Beale Duvall's mill -	22×1500 =	33.000
At school house ridge	18×4000 =	72.000
At Doctor Duvall's	43×1500 =	64.500
Snowden's ridge by Z. Duvall's	36×4000 =	144.000
Cuts of 15 feet deep	15×1400 =	21.000
Cuts under 15 ft deep	7×9450 =	66.150

$ $
550.650 × .0039 = 2147,54

Length of this division =	12.5610 miles	
Twice the Length of cuts	9.4130 miles	
Length of embankment, unrepaired from the cuts	3.1480 miles at $50 per mile =	157.40
		$2304.94

LOWERMOST ROUTE.

Third Division.

There are no cuts on this division so deep as 15 feet.		
The total length of the excavations=2900 feet.		
Therefore 5 × 2900=14500, and 14500 × $0039 =		$56.55
Length of this division =	7.9167 miles	
Twice the length of cuts	1.0985 miles	
Length of embankment unrepaired from the cuts	6.8182 miles at $50 per mile =	340.91
		$397.46

3. Summary of Lowermost route, by Smith's bridge.

Division.	*Miles.*		$
1st	6.8994	Repairs of graduation	1818.57
2d	12.5610	do.	2304.94
3d	7.9167	do.	397.46
4th and city	5.4640	do.	1087.71
Total	32.8411	average $170.79 per mile	$5608.68
Add ½ per cent per annum on $276.537, the estimated cost of masonry on this route, equal to $42.10 per mile = - - - - - -			1382.69
Add for superintendence $1500 per annum = $45.68 per mile - - - - - -			1500.00
Annual estimated cost of repairs of graduation, and masonry, being per mile $258.57			$8491.37

Equivalent capital per mile =$4,310
And for the route = $141.523

4. Summary of Lowermost Route by Hockley mill.

Division.	*Miles.*			$
1st	6.5443	Repairs of graduation	=	1518.57
2d	12.5610	do	=	2304.94
3d	7.9167	do	=	397.46
4th and city	5.4640	do	=	1087.71
	32.4860	average $163.42 per mile	=	$5308.68
Add ½ per cent per annum on $299.758, the estimated cost of masonry on this route, equal to $46.13 per mile = - - - - - -				1498.79
Add for superintendence $1500 per annum, = $46.17 per mile - - - - - -				1500.00
Annual estimated cost of repairs of graduation and masonry being per mile $255.72				$8307.47

Equivalent capital per mile = $4.262
And for the route = $138.458

2d. Division by the Clark Route.

Residue of Merrill's ridge	50 × 3000 =	150.000	
Cut near Beale Duvall's mill	22 × 1500 =	33.000	
School house ridge	39 × 2700 =	105.300	
Dr. Duvall's ridge	25 × 5000 =	125.000	
Snowden's ridge	36 × 3500 =	126.000	
Cuts of 15 feet deep and less average	10 × 9800 =	98.000	
		$	$
		637.300×0039 =	2485.47

	Miles.	
Length of this division	12.4453	
Twice the length of Cuts . -	.65919	
Length of embankment unrepaired from the cuts	2.7862 at $50 per mile =	139.31
		$2624.78

2d. Division by the Mill Route.

Residue of Merrill's ridge - -	50 × 3000 =	150,000	
Cut near B. Duvall's mill - -	22 × 1500 =	33,000	
School house ridge	39 × 3200 =	124,800	
Dr. Duvall's ridge	29 × 2600 =	75.400	
Tobias Duvall's field	25 × 1700 =	42.500	
Snowden's ridge	31 × 4400 =	140,800	
Cuts of 15 feet deep and less average	10×10800 =	108,000	
		$	$
		674.500 × 0039 =	2630.55

	miles.	
Length of this division	11.9998	
Twice the length of cuts - -	10.3030	
Length of embankment unrepaired from the cuts	1.6968 miles at $50 per mile =	84.84
		$2715.39

2d. *Division by the Hall Route.*

Residue of Merrill's ridge -	50 × 3000 =	150,000
Cut near B. Duvall's mill -	22 × 1500 =	33.000
School house ridge	39 × 2700 =	105.300
Cut in Clark's "	25 × 2500 =	62.500
Hall's and Snowden's ridges	45 × 9000 =	405.000
Cuts of 15 feet deep and less average	10 × 7500 =	75.000

$$830.800 \times \overset{\$}{0039} = \overset{\$}{3240.12}$$

	Miles.
Length of this division	11.9981
Twice the length of cuts - -	9.9242

Length of embankment unrepaired from the cuts }	2.0739 miles at $50 per mile	103.70
		$3343.82

2. *Division by the Intermediate Route.*

Residue of Merrill's ridge -	50 × 3000 =	150.000
Cut near B. Duvall's m.	22 × 1500 =	33.000
School house ridge	18 × 4000 =	72.000
At Doctor Duvall's	43 × 1500 =	64.500
Tobias Duvall's field	25 × 1700 =	42.500
Snowden's ridge	32 × 4400 =	140.800
Cuts of 15 feet deep and less average	10 × 10750 =	107.500

$$610.300 \times \overset{\$}{0039} = \overset{\$}{23.0817}$$

	Miles.
Length of this division	12.2803
Twice the length of cuts - -	10.1705

Length of embankment unrepaired from the cuts }	2.1098 miles at $50 per mile =	105.49
		$2485.66

5. *Summary of Clark Route by Smith's Bridge.*

Division.	*Miles.*		$
1st.	6.8994	Repairs of Graduation	1818.57
2d.	12.4453	do	2624.78
3d.	7.9167	do	397.46
4th and City	5.4640	do	1087.71
Total	32.7254	miles, ave. $181.16 per m.	$5928.52

Add ½ per cent per annum on $281,841 the estimated cost of masonry on this route, equal to $43.06 per mile	1409.21
Add for superintendence $1500 per annum, equal to $45.84 per mile	1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile, $270.06	$8837.73

Equivalent capital, per mile - $4,501

And for the route - - $147,296

6. *Summary of Clark Route by Hockley Mill.*

Division.	*Miles.*		$
1st.	6.5443	Repairs of Graduation	1518.57
2d.	12.4453	do	2624.78
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
	32.3703	miles, ave. $173.88 per m.	$5628.52

Add ½ per cent per annum on $305,062 the estimated cost of masonry on this route, equal to $47.12 per mile.	1525.31
Add for superintendence $1500 per annum, equal to $46.34 per mile	1500.00
Annual estimated cost of repairs of graduation and masonry, being, per mile $267.34.	$8653.83

Equivalent capital, per mile = $4,456

And for the route - - - $144,231

7. *Summary of Mill Route by Smith's Bridge.*

Division.	*Miles.*		$
1st.	6.8994	Repairs of Graduation	1818.57
2d.	11.9998	do	2715.39
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
Total	32.2799	miles, ave. $186.47 per m.	$6019.13

Add ½ per cent per annum on $281,752 the estimated cost of masonry on this route, equal to $43.64 per mile.	1408.76
Add for superintendence $1500 per annum, equal to $46.47 per mile	1500.00
Annual estimated cost of repairs of graduation and masonry, being $276.58 per mile	$8927.89

Equivalent capital per mile = $4,610
And for the route - - - $148,798

8. *Summary of Mill Route by Hockley Mill.*

Division.	*Miles.*		$
1st.	6.5443	Repairs of Graduation	1518.57
2d.	11.9998	do	2715.39
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
	Total 31.9248 miles, ave. $179.15 per m.		$5719.13
Add ½ per cent per annum on $304.973 the estimated cost of masonry on this route, equal to $47.76 per mile			1524.87
Add for superintendence $1500 per annum=46.99 per mile			1500.00
Annual estimated cost of repairs of graduation and masonry, being $273.89 per mile			$8744.00

Equivalent capital per mile $4,565
And for the route $145.733

9. *Summary of Hall route, by Smith's bridge.*

Divison.	*Miles.*		$
1st.	6.8994	Repairs of graduation	1818.57
2d.	11.9981	do	3343.82
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
	32.2782 miles, average $205.95 per m.		$6647.56
Add ½ per cent per annum on $278.176 the estimated cost of masonry, on this route, = $43.09 per mile			1390.88
Add for superintendence $1500 per annum equal to $46.47 per mile			1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile $295.51			$9538.44

Equivalent capital per mile = $4.925
And for the route - - - $158.974

10. *Summary of Hall Route by Hockley Mill.*

Division.	*Miles.*		$
1st.	6.5443	Repairs of graduation	1518.57
2d.	11.9981	do	3343.82
3d.	7.9167	do	397.46
4th and City	5.4640	do	1087.71
Total	31.9231	miles, average $198.84 per m.	$6347.56

Add ½ per cent per annum on $301.397, the estimated cost of masonry on this route, equal to $47.21 per mile	1506,99
Add for superintendence $1500 per annum, equal to $46.99 per mile	1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile $293.04	$9354.55

Equivalent capital per mile = $4.884
And for the route - - - $155.909

11. *Summary of Intermediate Route by Smith's Bridge.*

Division.	*Miles.*		$
1st.	6.8994	Repairs of graduation	1818.57
2d.	12.2803	do	2485.66
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
Total	32.5604	miles average $177.81 per m.	$5789.40

Add ½ per cent per annum on $277.168, the estimated cost of masonry on this route, equal to $42.56 per mile	1385 84
Add for superintendence $1500 per annum equal to $46.07 per mile	1500.00
Annual estimated cost of repairs of graduation and masonry, being per mile $266.44	$8675.24

Equivalent capital per mile = $4.441
And for the route - - - $144.587

12. *Summary of Intermediate route by Hockley Mill.*

Division.	*Miles.*		$
1st.	6.5443	Repairs of graduation	1518.57
2d.	12.2803	do	2485.66
3d.	7.9167	do	397.46
4th. and City	5.4640	do	1087.71
Total	32.2053	miles, average $170.45 per m.	$5489.10

Add ½ per cent per annum on $300.389 the estimated cost of masonry on this route equal to $46.64 per m.	1501.95

Add for superintendence $1500 per annum equal to $46.58 per mile	3500.00
Annual estimated cost of repairs of graduation and masonry, being $263.67 per mile	$8491.35

Equivalent capital per mile = $4.395
And for the route - - - $141.523

The results of the foregoing estimates of the *ordinary* repairs are embodied in Table No. III. annexed.

III. *Estimates of the probable cost of the rail way, and of the repairs and renewals of the same.*

Of the plans for the formation of a track of railway which have been, or may be employed, all of those that do not contain a provision for cross-ties, have been rejected, as being liable to a derangement in the relative horizontal position of the rails. The method of employing stone blocks without ties of wood or stone, is therefore not recommended; and it is not perceived that ties of iron can be advantageously substituted. It is believed that to resist with success, the action of locomotive engines having from 1½ to 2 tons upon a wheel, and moving with the higher velocities that will be required upon the Washington railway, the rail should weigh at least 35 lbs. per running yard, if supported continuously; or 51 lbs. if supported at intervals of three feet. This should be the malleable iron edge rail having a flat base, and rolled so as to economise the quantity of iron.

Ten different methods (inclusive of a variation in the materials) supposed to be amongst the best, for constructing a track of railway in this country, are estimated for in the following pages, and a preference amongst them awarded in favor of No. 10, that having supports of wood inclusive of a continuous string piece of southern yellow pine for the iron rail to rest upon, and to succeed the first track more temporary in its character, and therefore better fitted to be laid upon fresh embankments. The details of the estimates will now be given, whilst the results will be seen in the annexed table 4.

No. 1. Oak sills and sleepers with yellow pine string pieces, the latter supporting the iron edge rail rolled with a flat base, and weighing 35 lbs. per yard, or 55 tons per mile of track.

Per mile of Track, viz :

10,560 feet lineal, or to allow for loss, 11,000 feet of round logs for longitudinal sills, to be delivered on or near the road bed, at 4 cents per foot, - - -	$440

For hewing two opposite sides of these logs, so as to allow a bearing at least 3 inches wide on each side, clear of sap, at 2 cents per foot, - - - - -	$220
1320, or to allow for loss 1350 white oak sleepers, to bear transversely upon the sills every 4 feet, delivered in a rough state on or near the road bed, at 20 cents each, -	270
11,000 feet lineal yellow pine string pieces, sawed 6 inches square, to rest in notches upon the sleepers, and to support the iron rails, to be delivered in Baltimore at 7½ cents per foot,	825

Iron Fastenings, viz:

720 cast iron chairs (allowing 16 for loss) at the ends of the rails, to support the joinings vertically and laterally, each 4 lbs. at 5 cents per lb. or 20 cents each, - - -	144	
723 cast iron knees, at the middle of the rails to support them laterally on the exterior side, each 2 lbs. at 5 cents per lb. or 10 cents each,	72	
2160 wrought iron clips, being two for the ends, and one for the middle of the rail, on the side directly opposite to the cast iron supports, each ¼ lb. at 10 cents per lb. or 2½ cents each,	54	
2880 do. for intermediate spaces, at 2½ cents each, - - - - -	72	
5040 nails for the clips, at ½ cent each,	25	
720 spikes for the knees, at 1¼ cent each,	9	— 376
Transportation of 70 tons of string pieces, 2¾ tons iron fastenings, and 55 tons iron rails, in all 127¾ tons, on the Baltimore and Ohio rail road, from Baltimore to the Patapsco, at 50 cents per ton, - - - - - -		64
For hauling 127¾ tons by wagons, on the common roads to the several sections from the Patapsco to Washington, at $5 per ton, - - -		639
Turnpike tolls and charges incidental, at $2 per ton,		255

Workmanship, &c.

Distribution of wood and iron materials along the line on the road bed, per foot, lineal of the track, - - - -	cents 3½	
Excavating trenches for the reception of the longitudinal sills, - - - -	1½	
Imbedding the sills in the trenches, -	3	
Dressing and notching the sleepers, -	3½	
Adjusting sleepers on the sills, - -	0½	
Putting on the string pieces and iron rails,	4	
5280 feet lineal, at	cents 16	845

For making crossings and sidings,	$160
Materials for do and incidental charges,	200
Dressing off the road bed, opening drains, &c.	160
Local superintendence, vanemen, axemen, &c. in the pay of the contractors,	100
Amount,	$4.554
Add for contingencies 7 per cent,	319
Add for superintendence 5 per cent,	228
Amounting to	$5.101
55 tons iron rails, at $43.20 per ton,	2.376
Amount per mile, for the first track,	$7,477

The first track being completed, the transportation of materials for the second track can be effected upon it, so that the construction of the second track will be less costly than that of the first.

Estimate for the second Track.

In the estimate for the first track, the cost of hauling 127¾ tons of materials by wagon on the common roads, from the Patapsco towards Washington, inclusive of tolls, &c. is stated at	$894	
Now the same by railway, would be about	64	
Resulting in a saving of		$ 830
The saving the cost of distribution of materials, added to other facilities consequent on the first track, will probably equal,		100
		930
To which add 7 and 5 per cent,		112
Total saving,		$1042
The estimated cost of 1st track per mile, is,		$7,477
Less $1042, and the estimate for the 2d track is,		6,435
The estimated cost of the double track is =		$13,912
And the average of the single track is,		$6,956

Repairs and Renewals.

Southern yellow pine being a durable wood, and the estimated price being for the first quality, no doubt is entertained, but that it will endure 12 years, the oak being mostly, or altogether under ground will, it is believed, likewise last 12 years, before it will be necessary to renew it, and the same may be concluded in regard to the wrought iron clips and nails. The cast chairs, and knees, however, being of greater size, will doubtless endure twice that length of time, or 24 years; whilst the iron rails will probably last 50 years, but we shall at present assume the limit of their duration at 40 years, and the estimate will be as follows:

		$
11,000 feet lineal of oak sills to be imbedded in the earth under the sleepers, at 4 cts. per foot, delivered on the road, - - - - - -		440
Hewing two sides of the same at 2 cents per foot,		220
1350 white oak sleepers delivered in a rough state, at 20 cents, - - - - -		270
11,000 feet lineal southern yellow pine string pieces, 6 inches square, to rest in the notches of the sleepers, and to support the iron rails, delivered in Baltimore, at 7½ cents per foot, - - - - . -		825
Wrought iron fastenings to the rails, as in preceding estimate, - - - - - -		160
Transportation by railway of 70 tons string pieces and ¾ ton of wrought iron fastenings at $1 per ton, -		71
Workmanship, &c.		
Distribution of materials per foot of track, cents	2½	
Excavating trenches for the reception of longitudinal sills, - - - - -	1½	
Imbedding the sills in the trenches, -	3	
Dressing and notching the sleepers, - -	3½	
Adjusting sleepers on the sills, - -	0½	
Putting on the string pieces and iron rails, -	4	
5280 feet lineal - - - cents	15	792
For crossings and sidings, including materials, -		160
Dressing off the road bed - - - -		100
Amount =		$3.038
Add for contingencies and superintendence 10 per cent.		304
Total amount =		$3.342

An annuity of equivalent value (to $3,342 due 12 years hence) to commence at the end of one year, to continue 12 years, reckoning compound interest at 5 per cent. is $209.97.

The cast iron chairs and knees have been estimated at	$216
Transportation of the same 2 tons and distribution,	4
Contingencies, &c. - - - - -	22
Amount to be renewed in 24 years	$242

The equivalent annuity is $5.44.

	$
55 tons iron rails at $43.20 per ton	2376
Transportation and distribution,	100
Allowance for sidings, &c.	100
	2576
Deduct probable net value of old iron, say about half the original weight, 30 tons, at $22.40 per ton,	672
Amount of loss on the iron rails and to be renewed in 40 years,	$1904

The equivalent annuity is $15.76.

	$ cts.
The annual charge for renewals and repairs of the sills, sleepers, strings, wrought iron fastenings, and for labour and contingencies connected therewith, is	209.97
The annual charge consequent on the cast iron chairs and knees, is	5.44
The annual charge consequent on the iron rails is	15.76
Add for contingent repairs,	10.00
Total annual charge per track per mile,	$241.17
do for the double track per mile,	$482.34
The present worth of this annuity in perpetuity at 6 per cent per annum is	$8,039
The cost of construction of double track per mile is	$13,912
Capital equivalent to construction, repairs and renew.	$21,951

Otherwise stated.

The annual interest at 6 per cent on the cost of construction, $13,912, is	$834.72
And the annual charge for repairs and renewals is	$482.34
Total annual charge per mile of railway, double track and which is 6 per cent on $21,951	$1,317.06

No. 2. Sills, sleepers and strings, all of yellow pine, with iron rails, 35 lb. per yard, each bar, or 55 tons per mile of track, supported by strings 6 inches square, bearing on sleepers 4½ inches square, the latter resting upon longitudinal sills, 6 inches square, all of sawed southern yellow pine.

Per mile of Single Track, viz:

		$
11,000 feet lineal yellow pine sills, 6 inches square, to be delivered in Baltimore at 7½ cents per foot,		825
1,350 yellow pine sleepers, each 7 feet long and 4½ inches square, at 4 cents per foot, or 28 cents each, delivered in Baltimore, - - - -		378
11,000 feet lineal yellow pine string pieces, 6 inches square, to be delivered in Baltimore, at 7½ cents per foot,		825
5,400 cast iron knees, being 4 to each sleeper to hold in place the string pieces in lieu of notches and keys, weighing each 1¼ lb. at 5 cents per lb. or at 6¼ cents each, - - - - -	338	
10,800 nails, being two to each knee, at ½ cent each, - - - - - -	54	

The fastenings for the iron rails will be, viz:

720 cast iron chairs at ends of rails, each 4 lb. at 5 cents per lb. or 20 cents each, -	144	
720 cast iron knees at the middle of the rails, each 2 lb. at 5 cents per lb. or 10 cents each, -	72	
2,160 wrought iron clips, being two at ends, and one at middle of rail, each ¼ lb. at 10 cents per lb. or 2½ cents each, - - - -	54	
2,880 do. for intermediate spaces at 2½ cents each,	72	
5,040 nails for the clips at ½ cent each, -	25	
720 nails for the knees for rails at 1¼ cents each,	9 —	768
Transportation of 70 tons sills, 35 tons sleepers, 70 tons strings, 6 tons fastenings, and 55 tons rails, in all 236 tons of materials, by railway from Baltimore to Patapsco, at 50 cents, - - - -		118
Transportation of the same materials by wagons on common roads, thence to the sections inclusive of tolls, &c. at $7 per ton, - - - -		1652

Workmanship, &c.

	cts.	
Distribution of materials per foot lineal of track,	3	
Excavating trenches for longitudinal sills,	1½	
Imbedding the sills in the trenches, -	3	
Adjusting sleepers on the sills, -	0½	
Putting on the string pieces and iron rails	5	
5280 feet lineal at - - - - - -	13 ——	686
For making crossings and sidings - - -		160
Materials for do. and incidental charges - -		200

Dressing off the road bed, opening drains, &c.	160
Local superintendence, vanemen, axemen, &c.	100
Amount,	$5.872
Add for contingencies 7 per cent	411
Add for superintendence 5 per cent	294
Amounting to	$6,577
55 tons iron rails, at $43.20 per ton	2.376
The estimated cost per mile of the first track is	$8.953

Employing the first track for the transportation of materials for the second track, the latter will be cheapened as follows:

Estimate for the Second Track.

In the estimate for the first track the cost of transporting the materials, 236 tons from Patapsco towards Washington was estimated at $1652. The same by railway at 50 cents per ton will be 118

	$
Resulting in a saving of	1534
The saving in the cost of distribution of wood and iron, and other facilities will probably be	100
	1634
Also a saving of 12 per cent on the above	196
Total saving	$1,830

The estimated cost of the first tract per mile is	$8,953
Less $1830, and the estimate for the second track is	$7,123
The estimated cost of the double track is	$16.076
And the average of the single track is	$8.038

Repairs and renewals.

In the foregoing plan of construction, the sleepers will be from 6 to 10½ inches under the surface of the ground, and the longitudinal sills still deeper; these parts will therefore probably continue fit for use, twice the time that the string pieces, (being partly under, and partly above the ground,) will endure; I shall therefore assume the duration of the strings, and wrought iron fastenings at 12 years, that of the sleepers, and sills, and cast iron fastenings at 24 years, and that of the iron rails as before at 40 years. Therefore,

11.000 feet lineal yellow pine strings, 6 inches square delivered in Baltimore at 7½ cents per foot	$825
Renewal of all the wrought iron fastenings	214
70¾ tons transportation by railway at $1 per ton	71
Distribution of materials per foot lineal of track 1 ct.	53
Putting on the string pieces and iron rails 5 cts. per foot	264
For crossings and sidings a proportional part of	80
Dressing off the road bed	100
Amount =	$1.607
For contingencies and superintendence 10 per cent	161
Amount to be renewed every 12 years	$1,768

Equivalent annuity = $111.08.

Likewise.

11.000 ft. lineal yellow pine, longitudinal sills at 7½ cts. =	825
1350 sleepers at 28 cents	378
Renewal of all the cast iron fastenings	554
110 tons transportation by railway at $1 per ton	110
Distribution of materials per foot of track at 1¾ cents	90
Excavating of trenches for the sills at 1½ cents per foot	79
Imbedding the sills in the trenches at 3 cents per foot	158
Adjusting the sleepers on the sills at ½ per cent per ft.	26
For crossings and sidings, a proportional part	80
Amount	$2.300
Add for contingencies and superintendence 10 per ct.	230
Amount to be renewed every 24 years	$2.530

Equivalent annuity = $56.85

Summary.

	$ *cts.*
Annual cost on account of string pieces, wrought iron fastenings and labour, to be renewed every 12 years	111.08
Do. on account of sills, sleepers, and cast iron fastenings to be renewed every 24 years	56.85
Do. on account of iron rails to be renewed in 40 years	15.76
Do. contingent charges	10.00
Amount per track	$193.69
Annual charge per double track	$387.38
The present worth of this annuity in perpetuity at 6 per cent per annum, is	$6.456
The cost of construction was estimated at	$16.076
Capital equivalent to the construction, repairs and renewals of a mile of double railway	$22.532

Otherwise.

	$
The annual interest at 6 per cent on the cost of construction, $16.076, is	961.56
The annual charge for repairs and renewals is	387.38
Total annual charge per mile of double track, and which is 6 per cent on $22.532	$1,351.94

Yellow Pine Sleepers, Strings and Sills, succeeding Temporary Track.

No. 3. With iron rails, 35 lb. per yard each, or 55 tons per mile of track, resting on strings six inches square, that bear on cross sleepers 4½ inches square, the latter being supported upon longitudinal sills six inches square, all of sawed southern yellow pine.

Per mile of Single Track, viz.

11,000 feet lineal yellow pine, longitudinal sills, six inches square, to be delivered in Baltimore, at 7½ cents per foot		$825
1350 yellow pine sleepers, each 7 feet long, and 4½ inches square, at 4 cts. per foot, or 28 cts. each, delivered in Baltimore		378
11,000 feet lineal yellow pine string pieces, 6 inches square, to be delivered in Baltimore at 7½ cents per foot		825
5,400 cast iron knees, being four to each sleeper to hold in place the string pieces in lieu of notches and keys, weighing each 1¼ lb., and therefore, at 6¼ cents each	$338	
10,800 nails, being 2 to each knee, at ½ cent each	54	

The fastenings for the Iron Rails will be, viz.

720 cast iron chairs at ends of rails, each 4 lb. at 5 cts. per lb., or 20 cts. each,	144	
720 cast iron knees at the middle of the rails, each 2 lb. at 5 cents, or 10 cts. each	72	
2,160 wrought iron clips, being two for the ends, and one for the middle of the rail, each ¼ lb. at 10 cents per lb. or 2½ cents each	54	
2,880 do. for intermediate spaces at 2½ cts. each	72	
5,040 nails for the clips at ½ cent each	25	
720 nails for the knees at 1¼ cent each	9	768
Transportation of 70 tons sills, 70 tons strings, 35 tons sleepers, 6 tons fastenings, and 55 tons rails, in all 236 tons by railway, at $1 per ton		236

Workmanship, &c. viz.

Distribution of materials per foot, lineal of the track, cents	2½	
Excavating trenches for longitudinal sills	1½	
Imbedding the sills in the trenches	3	
Adjusting sleepers on the sills	0½	
Putting on the string pieces and iron rails	5	
5280 feet lineal at cents	12½	$660
For making crossings and sidings		160
Materials for do. and incidental charges		200
Dressing off the road bed, opening drains, &c.		100
Local superintendence, &c.		100
Amount		$4.252
Add for contingencies 7 per cent		298
Add for superintendence 5 per cent		212
Amounting to		$4.762
Iron rails, 55 tons at $43.20 per ton		2.376
The estimated cost per track, per mile is		$7.138
And for a double track		$14.276

Summary.

Annual charge on account of string pieces, wrought iron fastenings, labour, &c.	$111.08
Annual charge on account of longitudinal sills, sleepers, cast iron fastenings, &c.	56.85
Annual charge on account of iron rails	15.76
Annual contingent charges	10.00
Amount per track	$193.69
Annual charge per double track	$387.38
The present worth of this annuity in perpetuity at 6 per cent. per annum is	$6.456
The cost of construction was estimated at	14.276
Capital equivalent to construction repairs, and renewals,	$20.732

Otherwise.

	$
The annual interest at 6 per cent. on $14.276, (the cost of construction) is	856.56
And the annual charge for repairs and renewals is	387.38
Total annual charge per mile of double track, and which is 6 per cent on $20,732	$1243.94

No. 4. With stone blocks under the sleepers succeeding to the first track. The same form of construction as No. 2, except that stone blocks are substituted for the yellow pine longitudinal sills, so that the sleepers shall bear upon stone.

There are 1350 sleepers per track per mile, and there will be two blocks of stone to each sleeper, or 2700 stone blocks. These will cost about 50 cents each, plus 12½ cents for delivery, or 62½ cents each, making in the whole $1688.

The first cost and transportation of the yellow pine sills amounted to $895, hence the substitution of the stone blocks, will augment the cost $1688—$895 = $793 per track, plus 12 per cent, is $888.

The cost per track, with the pine sills,	$7,138
Add difference for stone blocks,	888
Cost per track with stone blocks,	$8,026
Cost of double track with do.	$16,052

The cost of renewal at the end of 24 years by the estimate, No 2, is,	$2530
From which will be deducted the cost of the pine sills $825, transportation $70, distribution $50, making $945, plus 10 per cent on the same,	1040
Balance to be renewed in twenty-four years,	$1490

Equivalent annuity = $33.48

Hence the annual charge is lessened on account of the stone blocks, the difference between $56.85 and $33.48, or $23.37 per track, equal to $46.74 per double track.

Annual charge per double track with pine sills =	$387.38
Deduct	46.74
Annual charge with stone blocks,	$340.64
The present worth of this annuity in perpetuity at six per cent.	$5.678

The cost of construction as just estimated, is	$16.052
Capital equivalent to cost of construction, repairs, and renewals = - - - - -	$21.730

Otherwise.

Annual interest at 6 per cent. on $16.052, cost of construction = - - - - - -	$963.12
The annual charge for repairs and renewals, is	340.64
Total annual charge per mile of double railway, which is 6 per cent. on $21.730, - -	$1,303.76

No. 5. Rails laid on hewed oak logs and sleepers, to be obtained in the vicinity of the road.

Estimate for a railway, formed by laying the iron rails weighing 35 lb per yard each, or 55 tons per mile of track, upon longitudinal oak sills, used as string pieces, and bearing upon white oak sleepers laid 8 feet apart, the sleepers and intermediate parts of the sills, resting upon the earth, in which they will be imbedded.

	$
11,000 feet lineal of oak sills, having two opposite sides hewn, delivered on or near the road bed, at 6 cents per foot, as in No. 1, - - - - -	660
675 white oak sleepers of a larger size than in No. 1, delivered in a rough state on or near the road bed, at 37½ cents each, - - - - - -	253
Cast iron fastenings as in No. 1, - -	216
Wrought iron do as in No. 1, - - -	160
Transportation by railway from Baltimore to Patapsco of 2¾ tons fastenings, and 55 tons iron rails, at 50 cents,	29
Transportation of the same by common roads in wagons to the several sections, thence to Washington, including turnpike tolls, average $7 per ton, - -	404

Workmanship, &c.

	cts.	
Distribution of materials per foot lineal of track,	2½	
Dressing and notching the sleepers, - -	2½	
Imbedding and levelling the sleepers, -	3½	
Placing and securing the sills upon the sleepers,	3½	
Putting on the iron rails, - - - -	3	
5280 feet lineal at - - cents	15	792
For making crossings and sidings, - -		160
Materials for do. and incidental charges, -		200

Dressing off the road bed, opening drains, &c.	$160
Local superintendence, &c. in pay of the contractor,	100
Amount	$3,134
Add for contingencies, 7 per cent,	220
Do. for superintendence, 5 per cent,	156
Amounting to	$3,510
55 tons iron rails, at $43.20 per ton	2,376
Amount per mile for the first track,	$5886

The second track will be made for a less sum, on account of the saving in the cost of transporting the iron upon the first track.

Estimated cost of transporting the iron upon the common roads,	$404	
The same will be by railway	29	$
Saving in this item,		375
Saving from other facilities, say		75
		450
12 per cent on the same,		54
Total saving in the construction of the second track,		$504

Estimated cost of the first track	$5.886
Less $504, and the cost of the second track is	5,382
Estimated cost of double track,	$11,268
Average per mile of single track,	$5,634

Repairs and Renewals.

It would appear from the preceding calculation, that succeeding tracks after the first will be laid upon this plan, for $5.382 per mile each. When, however, we reflect, that notwithstanding, for the first track, and possibly for the second, the sills can be procured for $660, yet, such will then be the scarcity of timber near the line of the road, and its enhancement in value, in consequence of the facilities of transit afforded from the railway, that subsequent purchases of that material must be effected at a higher rate probably by 50 per cent. It will not be safe therefore to estimate the cost per mile of track at a less sum than the average already stated, $5,634. *This will consist of, viz:*

1. Sills, sleepers, wrought iron fastenings, labor, transportation, contingencies and superintendence,	$ 2,816
2. Cast iron fastenings, transportation, &c. see No. 1,	242
3. Iron rails, and allowances for do. (see repairs and renewals, No. 1.)	2,575
The given amount =	$5,634

It is believed that a structure of the description here estimated for, must be renewed to the extent of the first item, $2,816, at the end of 8 years, and the annuity to cover this expense is $294.90.

Therefore,

The annual charge for 1st item is - - -	$294.90
Do. for 2d do. is - - - - - -	5.44
Do. for 3d do. is - - - - - -	15.76
Do. for contingent repairs - - - -	10.00
Annual charge for 1 track per mile =	$326.10
Do. for 2 tracks per mile - - -	$652.20
The present worth of this annuity in perpetuity at 6 per cent is - - . - - - -	$10.870
The cost of construction, per mile, double track =	11.268
Capital equivalent to construction, repairs and renewals - - - - - - - -	$22.138

Otherwise.

The annual interest at 6 per cent on the cost of construction, $11.268, is - . - - -	$ 676.08
The annual charge for repairs and renewals, is	652.20
Total annual charge per mile of railway double track, and 6 per cent, on $22.138	$1328.28

Oak Sleepers and no String pieces.

No. 6. With the rolled iron edge rail, having a flat base weighing 51 pounds per yard each bar, or 80 tons per mile of track, and to be laid on cross sleepers of white oak, the latter resting on longitudinal wood sills imbedded in the earth, wood strings between the rails and sleepers, being dispensed with.

Per mile of Single Track, viz:

10.560 feet lineal, or to allow for loss, say 11.000 feet, of round logs for the longitudinal sills, delivered on or near the road bed, at 4 cents per foot - - - -	$ 440
For hewing the two opposite sides of said logs, so as to give a bearing at least 3 inches wide on each side clear of sap, at 2 cents per foot - - - -	220
2500 white oak sleepers to be placed transversely upon the longitudinal sills, for the iron rails to rest upon, being 7 sleepers to each rail length, or 15 feet plus 36	

for loss, delivered in a rough state on or near the road-bed at 20 cents each		$500
720 cast iron chairs at the ends of the rails each 5 lb at 5 cents per lb. = 25 cents each =	$ 180	
720 do knees at the middle of the rails 3 lb. each at 5 cents = 15 cents each	108	
2160 wrought iron clips each ¼ lb. at 10 cents per lb, or 2½ cents each being two for the ends, and one for the middle of the rail =	54	
2160 nails for the same at ½ cent each =	11	
5760 spikes being 4 spikes for each of the four intermediate sleepers, as further fastenings to the rails at 1¼ cent each	72	425
For transportation of 80 tons iron rails and 3 tons of chairs, knees, clips, nails, and spikes, on the Baltimore and Ohio Rail Road, from Baltimore to the Patapsco at 50 cents per ton		42
For transportation of 83 tons iron materials in wagons and delivering the same on the several sections from the Patapsco to Washington, at $5 per ton =		415
For turnpike tolls and incidentals $2 per ton		166
		$2208

Workmanship, &c.

Distribution of wood and iron materials along the line on the road bed, and not included in other estimated expenses, per foot lineal of the track	cents 3¼	
Excavating trenches for the longitudinal sills	1½	
Imbedding the sills in the trenches	3	
Dressing sleepers	4	
Adjusting sleepers on the sills	1	
Putting on the iron rails and fastenings	3	
5280 feet lineal at	cents 15¾	832
For making crossings to public and private roads and laying down turnouts and sidings		160
Materials for do. and charges incident thereto		200
Dressing off the road bed, opening drains, &c.		160
Local superintendents, vanemen, and axemen in the service of the contractors		100
Amount =		$3,660
Add for contingencies, 7 per cent,		257
Add for superintendence, 5 per cent,		183
Amounting to		$4,100
80 tons iron rails at $46.08 per ton,		3686
Amount per mile of the first track,		$7,786

The second track will be constructed more cheaply, on accou of the facilities afforded by the first track for the transportatio of materials. This saving may be estimated as follows:

In the preceding estimate the cost of hauling iron material by wagon, turnpike, and tolls, for the formation of the first track amount to, - - - - -	$581
The same by railway upon the first track from Patapsco towards Washington, might average	42 = 53
The difference is a saving of - -	539
The saving in the cost of the distribution of wood and iron, and in other and contingent transportation, will probably equal, - - -	150
The saving in opening drains, &c. the road bed, and drains, being supposed in good repair, -	100
Advantage of the first track as a guide to the direction and level of the second track, -	51
Total saving =	$840

The estimated cost of the first track per mile is	$7,786
Less $840, and the estimate for the second track, =	6,946
The estimated cost of the double track, =	$14,732
And the average of the single track, is - -	$7,366

Repairs and Renewals.

Estimate of the probable cost per annum per mile of single track for repairs and renewals of the railway on the foregoing plan of construction.

	$
11,000 feet lineal of longitudinal oak sills to be imbedded in the earth, under the sleepers, delivered at 4 cents per foot, - - - - - -	440
Hewing two sides of the same at 2 cents per foot,	220
2,500 white oak sleepers to bear transversely of the sills, delivered in a rough state, at 20 cents each, -	500
Iron fastenings to secure the iron rails to the sleepers, equal to one half of the original cost, - -	213

Workmanship, &c.

Distribution of materials per foot lineal of the track, - - - - cents,	2½	
Excavating trenches for reception of the sills,	1½	
Imbedding the sills in the trenches, -	3	
Dressing sleepers, - - - -	4	
Adjusting sleepers on the sills, - -	1	
Putting on the iron rails and fastening -	3	
5280 feet lineal at - - - - cents	15	79

For crossings and sidings, including materials, workmanship, and incidentals,	$260
Dressing off the road bed,	100
Amount	$2.525
Add for contingencies and superintendence, 10 per ct.	253
Total amount	$2,778

This expenditure must be incurred at the end of about 12 years, and an annuity of equivalent value to commence at the end of 1 year, reckoning compound interest at 5 per cent, is $174.53.

Cost of iron rails, 80 tons, at $46.08,	$3,686
Transportation and distribution by railway,	150
Amounting to	$3,836
Deduct the probable net value of the old iron, say about half the original weight, 40 tons, at $22.40 per ton,	896
Amount of loss on the iron rails,	$2,940

Assuming 40 years as the period of the duration of the iron rails, the equivalent annuity is $24.34.

For renewing all except the iron rails,	$174.53
For renewing the iron rails,	24.34
For current charges,	15.00
Total annual charge per track per mile,	$213.87
Do. for double track per mile,	$427.74

The present worth of this annuity in perpetuity, at 6 per cent. per annum, is	$7.129
The cost of construction is,	14.732
Capital equivalent to construction, repairs and renewals,	$21.861

Otherwise.

The annual interest at 6 per cent. on the cost of construction $14.732 is,	$883.92
Whilst the annual charge for renewals, and repairs,	427.74
Total annual charge per mile of the double railway, which is 6 per cent. on $21.861,	$1,311.66

No. 7. Locust sleepers, yellow pine sills, but no string pieces to be laid subsequently to the first track.

The locust cross sleepers to rest on the pine sills, and the iron rails weight 51 lb. per yard each bar, or 80 tons per mile of track, to bear immediately upon the sleepers, without the intervention of a string piece.

Estimate per Mile, per Track, viz.

	$
11,000 feet lineal yellow pine sills, 6 inches square, to be delivered in Baltimore at 7½ cents per foot,	825
2500 locust sleepers, being 7 to each 15 feet, to be delivered at Baltimore in a rough state, at 45 cents,	1125
Cast iron fastenings as in No. 6,	288
Wrought iron fastenings as in No. 6,	137
Transportation of 70 tons sills, sleepers 156 tons, iron fastenings 3 tons, iron rails 80 tons, in all 229 tons, by railway at $1 per ton,	229

Workmanship, &c.

Distribution of materials per foot of track, cts.	2½	
Excavating trenches for the sills,	1½	
Imbedding the sills in the trenches,	3	
Dressing sleepers,	5	
Adjusting sleepers on the sills,	1	
Putting on the iron rails and fastenings,	3	
5280 feet lineal, cents	16	845
For making crossings to public and private roads and laying down turnouts and sidings,		160
Materials for do. and incidental charges,		200
Dressing off the road bed, opening drains, &c.		160
Local superintendents, &c.		100
Amount,		$4.069
Contingencies and superintendence 12 per cent,		488
Amounting to,		$4.557
80 tons iron rails at $46.08 cts. per ton,		3.686
Amount per mile per track,		$8.243
Do. do. double track,		$16.486

Repairs and Renewals.

On the assumption that the wrought iron fastenings must be renewed in 12 years, the iron rails in 40 years, and the timber and cast iron fastenings in 24 years, the estimate will be as follows.

Wrought iron fastenings $137, transportation and distribution of the same $4, with 10 per cent. for contingencies, &c. is $155, to be renewed in 12 years. The annuity is $9.75.

From the estimate for all except the iron rails, viz. $4.069, deduct the foregoing $155, and $100 for earth work on sidings, and add 10 per cent. for contingencies and superintendence, and the amount of repairs to be made at the end of 24 years, will be $4.195, for which the annuity is $94.27.

Therefore,

Annual cost of the wrought iron fastenings	$9.75
Annual cost of the cast iron fastenings, and the timber and labour - - - - - - - -	94.27
Annual charge relative to the iron rails - -	24.34
Annual contingent repairs - - - -	15.00
Total charge per annum per track per mile	$143.36
Do per double track per mile - - -	$286.72

The present worth of this annuity in perpetuity at 6 per cent per annum is - - - - -	$4,779
The cost of construction per double track is -	16,486
Capital equivalent to construction, repairs, and renewals per mile of double track	$21,265

Otherwise.

The annual interest on the cost of construction $16.486 at 6 per cent is - - - - - -	$989.16
The annual charge for repairs, and renewals, is	286.72
Total annual charge per mile of double track and which is equal to 6 per cent on $21.265	$1,275.88

No. 8. Locust string pieces, yellow pine sleepers and sills, to succeed the temporary track.

Estimate for a track of railway, with the iron rail, weight 35 lb. per yard each, or 55 tons per mile laid on Locust strings sawed 6 inches square, laid on sawed yellow pine sleepers 4½ inches square (4 feet apart) the latter resting upon sawed yellow pine sills 6 inches square. The strings being held to the sleepers by means of the cast iron knees.

The cost of this plan will differ from that of No. 3, only in the difference of the cost of locust and yellow pine strings—considering that the best of locust would be required, that it is a scarce material, and that it must be free from defects, it is probable, that suitable strings of locust, 8, 12 and 16 feet in length, could not be delivered at Baltimore, at a less price than $60 per M. board measure, equal to 18 cents per foot lineal of the string piece,—then per track:

	$
11.000 feet lineal of locust, at 18 cents per foot	1980
11.000 feet lineal, yellow pine at 7½ cents per foot	825
	$1,155
Add 12 per cent for contingencies and superintendence	139
Excess of cost with the locust	$1294
Cost per track with yellow pine strings	$7,138
Do with locust strings	$8,432
Do double track with locust	$16,864

Repairs and Renewals.

The wrought iron fastenings will last 12 years, the cast iron fastenings, and all the timber will be assumed to last 24 years, and the iron rails as before, at 40 years, then the repairs and renewals with this mode of construction, will be:

Wrought iron fastenings for the rails and chairs, as in No. 2,	$214
Transportation and distribution	6
	220
Add 10 per cent	22
Amount to be renewed in 12 years	$242

Equivalent annuity = $15.20

	$
The amount to be renewed in 12 years, estimated for in No. 3, was	1,768
Deduct for the wrought iron fastenings, as just estimated	242
Residue to be renewed in 24 years	1,526
Add excess of locust, over yellow pine strings	1,294
Add likewise the amount estimated for in No. 3, to be renewed in 24 years	2,530
Total amount to be renewed in 24 years, upon this mode of construction	$5,350

Equivalent annuity = $120.22

Summary.

	$
Annual charge on account of wrought iron fixtures to be renewed in 12 years, - - -	15.20
Annual charge on account of renewing the wood and cast iron every 24 years, . - -	120.22
Annual charge on account of iron rails, -	15.76
Annual contingent charges, - - -	10.00
Amount per track =	$161.18
Annual charge per double track, - -	$322.36
The present worth of this annuity in perpetuity at 6 per cent. per annum is, - - - -	$5,373
The cost of construction was estimated at -	$16,864
Capital of construction, repairs and renewals, =	$22,237

Otherwise.

	$
The annual interest at 6 per cent. on $16,864, the cost of construction, is - - - -	1011.84
The annual charge for repairs and renewals is,	322.36
Total annual charge per mile of double track, and which is 6 per cent on $22,237, - -	$1334.20

No. 9. With stone sills and iron only; to be laid subsequently to the temporary track.

Upon stone sills a similar rail to that estimated for in Nos. 1, 2, & 3, should be used, viz. 55 tons per mile of track, cross sills of stone at distances of 15 feet should be laid so as to have a transverse tie for each rail or bar; and if practicable, without too great expense all the joinings of the rails should be made upon the cross sills. These cross sills will be 7 feet long each, with a cross section of about one square foot. The intermediate 14 feet on each side of the track, or on both sides 28 feet, between each cross tie will be laid longitudinally with similar sills.

Estimate, &c.	cents.
Quarry charge per foot lineal of the sill,	1
Quarrying, - - - -	12½
Rough dressing, - - - -	1
Cutting for the reception of the rail, -	10
Transportation, and loading and unloading,	10
Sand 1½ feet in depth over the road, and in which the sills are to be imbedded, -	9

Laying down the sills in a proper manner, cts.	7½	
Drilling holes, &c. for the fastenings, -	2½	
Plugging the holes with wood, and putting on the iron rails, - - - - -	1½	
10,560 ft. lineal of sills in 1 mile of track at cts.	55	$5,808*
Iron fastenings for the rails as in No. 2,		376
Transportation of 55 tons rails, and 2¾ tons fastenings, at $1 per ton, - - - - -		58
For making crossings and sidings, double of No. 2,		320
Materials for do. and incidental charges, 50 per ct. on No. 2, - - - - - -		300
Dressing off the road bed, opening drains, &c.		100
Local superintendence, &c. double of No. 2,		200
Amount = -		$7,142
Add for contingencies, 7 per cent. - -		500
Add for superintendence, 5 per cent. -		357
Amounting to, - - -		$7,999
55 tons iron rails at $43.20 per ton, - -		2,376
The estimated cost per track per mile, is - -		$10,375
And for a double track, - - -		$20,750

Repairs and Renewals.

It will be assumed that the permanency of the stone sills laid as contemplated in the last estimate, will be such as not to require their repair and renewal. The better to secure this result, it will be necessary to employ the sand estimated for, as well as the cross ties of stone, and to postpone the construction, on embankments for at least five years, or until the settlings have subsided. The iron parts will, however, have to be renewed, viz.

	$
¾ ton wrought iron fastenings for the rails, as in No. 2,	160
Transportation $1, distribution and putting on $166	167
For crossings and sidings, and incidentals, -	100
	$427
Contingencies, &c. 10 per cent. - -	43
To be renewed every 12 years, - - -	$470

Annuity = $29.53.

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* This amount is expected to cover the expense likewise of the cross ties.

	$
2 tons cast iron fastenings as in No. 2,	216
Transportation $2, distribution and putting on $160,	162
For crossings, &c.	160
	$538
Contingencies, &c. 10 per cent.	54
To be renewed in 24 years	$592

Annuity = $13.30.

Summary.

		$
Annual charge	on account of wrought iron fastenings,	29.53
Do.	on account of cast do.	13.30
Do.	on account of iron rails,	14.94
Do.	contingent,	10.00
Annual charge	per track of stone sills, road,	$67.77
Do.	for double track,	$135.54

The present worth of this annuity in perpetuity, at 6 per cent. =	$2,259
The cost of construction was estimated at	$20,750
Capital equivalent to construction, repairs and renewals	$23,009

Otherwise,

Annual interest at 6 per cent. on $20,750 (the construction) is	$1245.00
The annual charge for repairs and renewals,	135.51
And the total annual charge per mile of double track of the stone sill and iron railway is equal to 6 per cent. on $23,009, or	$1380.51

No. 10. Temporary track as in No. 5 to be succeeded by double track as in No. 3.

It is here proposed that the first track shall be laid as No. 5 (using the heavy iron rails of 55 tons per mile) and to be styled the temporary track, because it will be composed of timber, acquired in the vicinity of the line, and used in the most simple form practicable, and therefore will not endure probably more than 8 years; during 5 years of the earlier part of this period, the track will have to be frequently raised and readjusted to the primitive levels on account of the subsiding and settling of the embankments of earth upon which the track will rest. This track, so laid, will cost, in its construction, according to estimate No. 5, the sum of $5,886 per mile. The track made of more durable materials, as estimated for in No. 2 and No. 3, and which the estimates show to be the cheapest in the end, will, according to No. 2, as the first track, and not preceded by the temporary track, cost $8,953 per mile, whilst the second track upon the same plan of construction succeeding the first track, or the first track as in No. 3, succeeding the temporary track, will cost only $7,138 per mile.

From which it results, that

The construction, according to No. 2, without being preceded by the temporary track, will cost per mile of double track, - - - - -	$16,076
Whilst according to No. 3, the materials and workmanship being identical with No. 2, but succeeding the temporary track, the cost per mile of double track will be,	$14,276
Difference =	$1,800

This difference arises altogether from the cheapness, with which the materials used in the construction can be transported on the railway, in comparison with the same upon the turnpike and common roads. This amount of $1,800 per mile for transportation, is for the first track, requiring, of yellow pine sills 70 tons; pine sleepers 35 tons, pine strings 70 tons, iron fastenings 6 tons, and iron rails 55 tons. Total 236 tons per mile of track, and costing for 30 miles, the large sum of $54.000. Whereas in the construction of the proposed temporary track, the only transportation upon the turnpike and common roads would be that of the iron rails, and iron fastenings estimated for in No. 5, viz. 57¾ tons, the amount of which with the proper per centage and allowances for distribution is $504, or for 30 miles $15,120 being a less sum than that just before stated, by $38,880, and which should be saved if practicable.

Consulting a due economy in the construction I should say that the second track ought not to be laid until the end of 5 years after the laying down of the first track, or until the embankments have become firm and stable, otherwise much expense will be incurred in its readjustment, and being composed of more materials than the temporary track, the second track will be proportionally more expensive to raise from a state of depression, whilst it will consequently be more subject to a partial derangement of the parts in the operation. The first track of No. 3, would therefore in 5 years, become the second track in relation to the temporary track, the latter being laid down forthwith upon the raw graduation of the road bed, so as to command the use of the rail road at the earliest day possible, whilst the second track of No. 3, would at the end of 3 years more, or of 8 years from the commencement, take the place of the temporary track, the latter being then no longer fit for use, with the exception of the cast iron fastenings, and the iron rails, both of which would be transferred to the new track.

Estimate.

Three tracks upon this plan, must be estimated for, in present money. The temporary track will cost, per estimate No. 5, in present money $5,886. The succeeding, or second track will cost per estimate No. 3, $7,138 to be expended 5 years hence. Now $5,593 present money invested at 5 per cent per annum, compound interest (the interests being annually invested) will at the end of 5 years amount to the given sum of $7,138, and consequently the cost of this track discounted to present money is $5,593. The second track of No. 3, and which is to succeed the temporary track in 8 years, will also cost $7,138. But to this track the temporary track will contribute the cast iron fastenings estimated in No. 5, to cost $216 plus transportation, &c. $26, or $242, together with the iron rails, costing in the estimate No. 5, $2,376, plus allowances for turnouts, &c. and transportation upon railway $200, or $2,576, both items together making $2,818. This deducted from $7,138, leaves $4,320 as the cost of the new materials and labour to be expended at the end of 8 years in the formation of this track. The present worth of which is $2,924.

	$
Present cost of temporary track - -	5,886
Do of 2d track, laid five years hence -	5,593
Do of 3d track laid 8 years hence - -	2,924
Total present cost per mile of double track, laid in the manner and order of time mentioned	$14,403

I shall therefore estimate the present cost of a double track per mile, by this combined mode of construction and which appears to be the cheapest and best, that has been proposed at the round sum of - - - -	$14,500
And the annual repairs and renewals per double track per mile at - - - - -	$400
The present worth of $400 per annum in perpetuity at 6 per cent per annum is - - - -	$6,667
The cost of construction is estimated at -	$14,500
Capital equivalent to construction and repairs =	$21,167

Otherwise.

	$
The annual interest at 6 per cent on the cost of construction $14.500 is - - - - -	870.00
The annual charge for repairs and renewals is estimated at - - - - - -	400.00
Total annual charge per mile of double track, and which is 6 per cent on $21.167	$1,270.00

All the foregoing results are embodied in table 4, annexed and previously referred to.

IV. *Motive Power and Machinery.*

The moving power will be steam with locomotive engines, each locomotive weighing, with fuel and water, say 6½ tons, and to work with the adhesion of two wheels, and a weight of four tons through them. The boiler to be upright and tubular, and the fuel, anthracite coal. The wheels to be chilled cast iron, three feet in diameter, and geared to the requisite speed. The engine will be accompanied with a separate tender carriage upon four wheels, the weight of which with the tank, water and fuel, will average 5 tons. The prime cost of the locomotive engine and its appurtenant machinery, $4,000; and of the tender and its appurtenances, $360.

Locomotives of different descriptions of boiler and wheels, may however, be employed.

We shall now proceed to form the necessary estimates under this head.

Prime cost of Cars.

	$
Wheels 30 inches diameter, each 210 lb. per car 840 lb., at 40 cts. (including ¼ ct. for chill,) =	33.60
Axles 140 lb. each, per car 280 lb. at 10 cents, =	28.00
Fitting up wheels and axles per car, = - -	14.48
Four boxes, chilled, 98 lb. at 4 cents, = -	3.92
Cost of wheels, axles, and boxes, per car =	$80.00

Platform Car, for Stone, Flour, &c.

Wheels, axles, and boxes, as above, - -		$80.00
Iron work in body, 50 lb. at 12½ cts.	$6.25	
Wood, wood work, and brake, - -	27.75	
Car body, - - - - - -		34.00
Steel springs, 140 lb. at 16 cts. -	$22.40	
Castings for do. 35 lb. at 4 cents, = -	1.40	
Bolts, &c. - - - -	1.00	

Cost of steel springs and appurtenances, =		$24.80
Cost of each platform car with springs,		$138.80

Weight of car 2300 lb.

Box Car for Coal, Lime, Flour, &c.

Wheels, axles, and boxes, as above,		80.00
Iron work of body 50 lb. at 12½ cts. =	$6.25	
Wood and wood work.	39.75	
		46.00
Steel springs,		24.80
Cost of box car with springs, =		$150.80

Weight of car 2400 lb.

House Car for Dry Goods, &c.

Wheels, axles, and boxes as above,		$80.00
Iron work of body 55 lb. at 12½ cts. =	$6.87½	
Wood and wood work,	45.12½	
		52.00
Steel springs,		24.80
Cost of house car with springs, =		156.80

Weight of car 2600 lb.

Passenger Car or Coach.

Wheels, axles, and boxes as in burthen cars, =	$80.00
Bodies, including springs, brakes, &c. =	620.00
	$700.00

Weight of car 2600 lb.

The diameter of the wheels is assumed at 30 inches, that size affording a good and cheap cast iron chilled wheel, nevertheless, the diameter may be enlarged to 36 inches, should the consequent increase of effective power be considered as warranting the more costly wheel, a point, upon which there is doubt.

Annual cost of Cars.

Wheels. The English reckon the duration of malleable iron wheels, or rims of wheels, upon railways, at three years; and of chilled cast iron rims at five years in constant use. In Wood's treatise on Rail Roads, London, 1831, page 69, it is observed, that "previous to this ["case-hardening" or chilling] the cost of wheels was a very serious charge in the annual repair of the carriages: but the wheels now, when properly case-hardened, work for many years without wearing away. Several, which have been in use for eight years, are still in good order; and, from their appearance, are likely to remain so for a considerable length of time to come." This would seem to indicate about 10 years as the duration of the best chilled wheel, from whence an average of 5 years might be inferred; and a wheel would travel a distance of 312 (days) × 5 (years) × 20 (miles) = 31,200 miles. This, however, would depend upon the length of the circumference of the wheel, and the weight bearing through it upon the rail, and somewhat upon the velocity of the car, and degree of perfection in the railway.

Several passenger cars have, with the same wheels, been upon the Baltimore and Ohio Rail Road, two years, and in that time have travelled a distance, equal it is believed, to 60 miles per day for one half of the time, and at a speed of about 10 miles per hour whilst in motion. The distance traversed has therefore, probably been 365 × 60 = 21,900 miles. These wheels appear yet to be comparatively perfect, and may probably endure another year of similar service: the entire distance travelled will then have been 32,850 miles. These are of cast iron, chilled, and 30 inches in diameter. The average load carried is estimated at 3200 lb. the entire weight of the car when empty is 2600; total 5800 lb. = 2.5893 tons, or, upon each of the four wheels .6473 tons. These wheels had frequently, during every day to traverse curves of 400 feet radius, and that they might do this with the greater facility, were coned near the flange, the major part of the rim being cylindrical, as is well known, the wheels having been described in the Annual Reports of the company, already published.

The wheels, velocity, and railway being the same; the duration of the former will be inversely as the insistent weight: accordingly in a car the weight of which, with its load, is 4 tons, the weight per wheel is 1 ton, and the distance the wheel will travel is found by the proportion 1 ton : .6473 tons : : 32,850 miles : 21,263 miles. All else being equal, the duration of the wheels will be greater with steam than with horse-power, since the gritty matter cast upon the rails by the action of the horses' feet, not only increases the resistance to the draught perhaps 25 per cent., but likewise, accelerates the wearing-out process constantly going on upon the wheels and the rails from the action of the former upon the latter. The wheels will also be more durable upon a straight than upon a curved railway; consequently, even on this account alone, the radius of curvature should be as great as may be practicable. The radius of curvature is much greater upon the Washington line than upon the Baltimore and Ohio Rail Road, between Baltimore and Frederick, and steam must be the power employed upon the Washington railway. Now these two circumstances will render the wheels more durable upon the Washington, than they have been upon the Baltimore and Ohio Railway. It would seem, therefore, that in a calculation in relation to wheels for the Washington Railway, we might safely adopt, as data, the foregoing results. Well knowing, however, that imperfections in machinery are unavoidable, and that these may exist, though not at first discernible, to an extent that may, in many instances at least, impair the goodness of the wheels, so that their duration shall be considerably reduced from the ratio already deduced; I propose to lessen the amount 25 per cent.

The distance that a wheel 30 inches diameter will endure to travel, with the respective weights annexed, at a velocity of 8 to 10 miles per hour, will then be reckoned as follows:

	Tons.		*Miles.*
Passenger car, weight upon 1 wheel	.6473	will travel	24,638
Do - do -	.7500	do	21,264
Burthen car - do -	1.0000	do	15,948
Tender car, and the lighter end of the locomotive, on 1 wheel	1.2500	do	12,760
Adhesion wheel of locomotive	2.0000	do	7,974

The cars are supposed to perform daily a circular trip between Baltimore and Washington, in round numbers say 80 miles per day—consequently the wheels of the burthen cars in constant use must be renewed in $\frac{15948}{80} = 200$ days, more or less, and the cost will be as follows:

	$
4 new wheels 840 lb. at 4 cents - -	33.60
Fitting up - - - - -	14.48
	48.08
Deduct for old iron 840 lb. at 1 cent = - -	8.40
Cost of renewing wheels per car for every 200 days constant use	$39.68

Then for the year of 312 days it will be, 200 : 312 : : $39.68 : $61.90 per annum for the renewal of wheels, when the weight for each wheel is 1 ton and distance travelled per day 80 miles at 8 or 10 miles per hour.

Axles and chilled boxes. It is believed these will last fully 3 years under the foregoing conditions of travel, and that one third of the prime cost less the worth of the old iron will be a sufficient allowance for repairs and risk, the weight of each axle being 140 lb.

	$
Two axles, weight 280 lb. at 10 cents =	28.00
Less 280 lb. old iron at 1½ cents =	4.20
	3) $23.80
Cost of axles per annum	$7.94
4 chilled boxes, 98 lb. at 4 cents	3.92
Less 98 lb. old iron at 1 cent	.98
To last 3 years	3) $2.94
Cost of chilled boxes per annum	$0.98
Axles and boxes per car per annum =	$8.92

Steel Springs. These will be very durable and need not be renewed oftener than once in 5 or 6 years, inclusive of risk.

First cost of springs, and their fixtures,	$24.80
Deduct for old iron 175 lb. at 1 cent =	1.75
	5) 23.05
Cost of springs per car per annum	$4.61

Bodies. The body of the platform car costs	$34.00
Deduct for old materials, wood and iron	1.50
The body of this car will probably last 2 years under the conditions of velocity and usage supposed	2) 32.50
Cost of bodies per car per annum =	$16.25
The box car body, first cost	46.00
Deduct for old materials	1.50
Will probably last 3 years	3) 44.50
Cost of bodies per car per annum =	$14.83
The house car body will cost	$52.00
Deduct for old materials	2.00
Will probably last 3 years.	3) 50.00
Cost of house car bodies per car per annum =	16.67

Therefore,		$
Annual cost per car, for platform bodies	=	16.25
Do box bodies	=	14.83
Do house bodies	=	16.67
		3) 47.75
Supposing an equal number of each kind in use, the average annual cost of bodies will be, per car		$15.92

Oil. By judicious arrangements in the machinery, the consumption of this article is reduced to a very small quantity. Cars weighing gross 3½ tons, make two circular trips between Baltimore and Frederick, thus travelling, say 245 miles, with but a single oiling in which a half a pint of oil only is used. This is a gallon of oil costing 100 cents for 3920 miles. At 2½ tons of freight per car, the cost of oil therefore is but 100 cents for the carriage of 9900 tons 1 mile or at the rate of only 1-99th of a cent per ton per mile: This quantity appears from experience to be an ample allowance, and 100 cents per gallon is rather a high price; consequently at 100 cents per car for 3920 miles, it will be, in round numbers 1-40th of a cent per car per mile, equal to 2 cents per day for each car performing a circular trip in a day between Washington and Baltimore, or per car per annum $6.24

Empty Cars. The trade may not be equal in tonnage in each direction; and if it were so taking the year together, yet the equality would not be uniform through all portions of the year. We are under the necessity therefore, to allow for the wear and tear of empty cars. It may probably be found that one third of the number of cars in motion during the year, will be empty; if so, these will constitute about one tenth part of the gross tonnage, and the wear and tear will be augmented very nearly in the same proportion: 10 per cent will consequently be added for this item of expense.

Spare Cars. To admit each locomotive to perform one circular trip every day with a full train of laden cars, there must be, besides the train in motion,

1 Train at Baltimore.
1 do at Washington.
1 do contingent.
1 do being repaired.
4

Making 4 trains in excess beyond the train in transitu with the engine. Every car in constant use will therefore be taxed with the interest upon the prime cost of 4 cars besides the interest upon its own cost.

Prime cost of a Car and interest.

		$
Prime cost of a platform car	= - -	138.80
Do of box do	= - -	150.80
Do of house do	= - -	156.80
		3) 446.40
Average prime cost per car	- -	$148.80

Annual interest = $8.93.

The annual cost of a burthen car in constant use running 80 miles per day during 10 hours, at 8 miles per hour, weight of car $1\frac{1}{4}$ tons, and carrying 3 tons of freight 312 days in the year, *will be as follows:* The tonnage of freight conveyed will be 312 × 80 × 3 = 74,880 tons *one mile*, and the cost of cars per ton per mile may be detailed as follows:

	$		of a cent.
Annual cost of wheels =	61.90	= per ton per mile,	·08267
Axles and boxes, =	8.92	= - -	.01191
Springs, =	4.61	= - -	·00616
Body, =	15.92	= - -	·02126
Oil, =	6.24	= - -	·00834
Empty cars, wear and tear of, =	9.76	= - -	·01304
Interest on 1 running car =	8.93	= - -	·01192
Interest on 4 spare cars =	35.72	= - -	·04769
Per car =	$152.00	= - -	·20299

Combining the seven first items, we have the cost of wear and tear per annum of one burthen car in constant use, equal to $116.28, and since the distance run in a year is to be 312 × 80 = 24,960 miles, the cost per car per mile = $\frac{11628}{24960}$ = ·46587 of a cent, or $\frac{1}{2}$ cent nearly. And it will be,

	per annum $	pr. car pr. mile. of a cent.	pr. ton of freight pr. mile. of a cent.
For 1 car in actual use,	116.28	·46587	·15530
Interest on 4 spare cars,	35.72	·14311	.04769
Total cost per car in use,	$152.00	·60898	·20299

Or 49 cents per car per day.

Prime cost of the Tender Carriage and Tank, to accompany the Locomotive Engine.

4 wheels each 300 lb. 1200 lb. at 4 cts. - -	$48.00
2 axles each 200 lb. 400 lb. at 10 cts. -	40.00
4 chilled boxes, 98 lb. at 4 cts. - - -	3.92
Fitting up wheels and axles, - -	14.48
Springs and their fixtures, 180 lb. - -	26.00
Body, - - - - - - -	46.00
Tank 1100 lb. iron at 15 cts, - - -	165.00
Hose, &c. - - - - -	16.60
Total first cost of tender and tank, = - -	$360.00

Total weight 5 tons, or 1¼ tons per wheel.

Annual Repairs and Renewals of Tender.

	$
Wheels. Four new wheels, 1200 lb. at 4 cts. -	48.00
Fitting up wheels on the axles, - -	14.48
	62.48
Less 1200 lb. old iron at 1 ct. - - -	12.00
Cost of each renewal of tender wheels, =	$50.48

It has been determined that a wheel bearing on the rail with a weight of 1¼ tons will endure to run 12,760 miles at from 8 to 10 miles per hour; at 80 miles per day, therefore, the wheels must be renewed after running $\frac{12760}{80} = 160$ days. Then for the year of 312 days the expense of wheels for the tender will be 160 : 312 : : $50.48 : $98.44.

	$
Axles and boxes. Two axles 400 lb. at 10 cts. -	40.00
Less 400 lb. old iron at 1½ cts. - - -	6.00
	3)34.00
Cost of axles per annum, - - -	11.34
Boxes the same as for burthen cars, - -	.98
Annual cost of axles and boxes, - -	$12.32

	$
Steel springs. First cost of springs and their fixtures, = - - - - -	26.00
Less for old iron, 180 lb. at 1 cent, - -	1.80

	5)24.20
Cost per annum of springs for tender, =	$4.84
Body. The same as for the box car, per annum,	$14.83

Tank. Being of iron, will probably last 10 years.

	$
Prime cost 1100 lb. at 15 cts.	165.00
Deduct from old iron, half weight 550 lb. at 1 ct.	5.50
	$159.50

Annuity equivalent to this sum = $12.68

Hose. These will probably cost $10 per annum.

Recapitulation.

Wheels, per annum,	$98.44
Axles and boxes,	12.32
Springs,	4.84
Body,	14.83
Tank,	12.68
Hose,	10.00
Oil, 25 per ct. more than for burthen cars, =	7.80
Interest on $360 prime cost,	21.60
Cost per annum of tender and tank =	$182.57

Distance passed over in a year in the transit of freight, 312 × 80 = 24,960 miles, therefore the cost of the tender and its appurtenances, will be $\frac{18251}{24960}$ = ·73129, or nearly ¾ of a cent per mile.

Or per day, 58½ cents.

Estimate of the annual charge of a Locomotive Engine in constant use.

Two adhesion wheels, weight 1036 lb. at 4 cts. per lb. less 1 ct. per lb. for old iron, or, at 3 cts. per lb. = $31.08, to be renewed 4 times a year, amounting, with interest, to	$127.11
The axle, 268 lb. at 10 cents, less 1½ cts. for old iron, or 8½ cts. per lb. to be renewed once a year,	22.78
Fitting up the two wheels and axle, including boring and banding, 4 times a year, at $8 per wheel each time, with interest,	65.44

		$
Two other wheels, same weight to be renewed twice a year, with interest, -	$63.09	
The axle, same as the other, but will last 3 years; $22.78, one-third of which is,	7.60	
Fitting up the two latter wheels twice a year, - - - - -	32.48	
The road wheels and their axles, per annum, =		318.50

The Boiler and its appurtenant parts.

Principal part of the boiler, weight 1600 lb. at 20 cts. per lb. = $320, to be renewed in 10 years, equivalent annuity, -	25.45	
That part constituting the fire place, 400 lb. at 25 cts. = $100 to be renewed in 3 years, - - - - -	33.34	
Tubes, hammered iron, 400 in number, each one inch interior diameter, length 37 inches, thickness of metal $\frac{3}{32}$ inches, weighing in the whole 1260 lb. at 40 cts. to be renewed yearly, - - -	504.00	
Fire bars, 300 lb. at 4 cts. = $12, to be renewed twice a year, with interest, -	24.36	
Ashpan 200 lb. at 15 cts. = $30 to be renewed in two years, - -	15.00	
Smoke stack, 100 lb. at 18 cts, yearly, =	18.00	
Fire doors, yearly, - - -	5.00	
Boiler and appurtenant parts, per annum, =		625.15
Wheel and pinion 400 lb. at 5 cts. pr. lb. $20. with cost of refitting the same at each renewal $16. making $36. to be renewed 3 times a year, with interest. =		110.16
Current repairs of the remaining parts of the *Steam Engine* and Carriage, at 50 cts. per day, or per year of 365 days. - - - -		182.50
The prime cost and profit of workmanship upon all parts of the Engine and Carriage, the renewals of which have not already been estimated, is about $2,800, in addition to the current repairs just estimated; it is believed that these parts will have to be renewed in 10 years, and the annuity is, = - - -		222.62
Oil, packing, and tools, 50 cts. per day, =		182.50
Amounting to =		$1641.43

The foregoing estimate is predicated upon an average speed of 8 miles per hour for 10 hours in the day throughout the year of 365 days. With passengers and the mails, the Engine with its train must make 365 trips circular per year between the two Cities, travelling 80 miles per day. With freight, however, the number of trips of 80 miles each will be 312 in the year, and the amount of annual expense will be lessened in proportion:

Then 365 : 312 : : $1641.43 : $1403.09

With freight therefore the repairs and renewals of the Locomotive per year of 312 days, will be - =	$ 1403.09
Interest for a year on $4000, the prime cost, =	240.00
Annual cost of one Locomotive in constant use being per day $5 27 - - -	$1643.09
Tender to the Engine for freight, $0.58 per day or per annum, - - - -	182.51
Annual charge for wear and tear and renewals of one Locomotive and tender for carriage of freight or per day $5.85, or per mile $7\frac{314}{1000}$ cents, -	$1825.60

The preceding is the estimate of the annual cost of repairs and renewals of a Locomotive and tender, to be engaged in the transit of commodities at a speed of 8 miles per hour 10 hours each day for 312 days in the year, and it would likewise be the estimate in the conveyance of persons at the like speed and for the same *time*. But, in the latter service the Engine will travel 365 days in the year, whilst the speed will probably be made to average 20 miles an hour, in order that the distance between the cities shall be passed in *two hours*, and the trip circular of 80 miles, in 4 hours running. The wear and tear will therefore be increased on account of the augmented intensity of the action, and in a greater ratio than that of the simple increase of velocity, whilst the distance travelled is the same in each case. This will arise from the unavoidable imperfections in the machinery and in the railway, and the concussions that will inevitably follow from these causes. We shall assume the increase of wear and tear at 50 per cent.

Wherefore. The repairs and renewals of the Locomotive in 365 days, velocity 8 miles per hour, 10 hours each day, as already estimated, - - =	$ 1641.43
The repairs and renewals of the tender during the same time, - - - - - =	182.51
	1823.94

Add for increased speed, being 20 miles per hour for 4 hours each day, 50 per centum, - =	911.97
Renewals and repairs in 365 days running, =	$2735.91
Add interest of $4000 = prime cost of engine, =	240.00
Annual repairs, renewals, and interest of one Locomotive Engine and tender in use with a speed of 20 miles per hour, 4 hours a day. - -	$2975.91

The daily cost is $8.15\frac{1}{3}$.

And the cost per mile is, $10\frac{191}{1000}$ cents.

Coaches, or passenger Cars, their annual cost.

Whilst the weight pr. wheel of the burthen cars is 1 ton, or at most $1\frac{1}{8}$ tons, that of the passenger cars will not exceed $\frac{3}{4}$ of a ton, and will average about .6473 tons, or 5800 lb. per car; nevertheless for safety in guarding against fracture, wheels and axles of equal weight with those in the former, will be used in the latter. The forms will likewise be precisely the same.

On account of the difference of weight, all else being equal, the duration of wheels in the passenger cars will exceed those in the burthen cars, and it has already been stated that whilst the latter will run 15,948 miles, the former will continue 24,638 miles, the velocity in both cases being 8 to 10 miles per hour. Now the cost of renewing the wheels of a car is $39.68, as herein before mentioned; and at 80 miles per day, the duration will be $\frac{24638}{80}$ = 308 days. Then for the year of 365 days, 308 : 365 : : $39.68 : $47.03 = the cost per annum of renewing wheels per car.

It has been estimated that the annual charge for axles and chilled boxes, weight upon a wheel 1 ton, will be $8.92, then for a weight of .6473 tons, it will be 1 : .6473 : : 8.92 : $5.77 for the year of 312 days; and 312 : 365 : : $5.77 : $6.75 for the cost of axles and boxes per passenger car for a year of 365 days.

The cost of Oil will be in a similar ratio, therefore, the cost of this article for burthen cars being $6.24, 8.92 : 6.75 : : 6.24 : $4.73 = the annual cost of oil for a passenger car.

Summary.	$
Annual charge for wheels, - - -	47.03
- - Axles and boxes, - -	6.75
Springs are included in the cost of body -	0.00
- - Oil, - - - -	4.73
Cos per annum at a speed of 8 miles per hour =	$58.51

The disadvantage of increased speed will not be so great in the coaches as in the engine, therefore add 40 per cent for higher speed,	23.40
Coach body including springs, brake and every thing but the wheels, axles, and boxes, prime cost $620, to be renewed in 5 years, annuity, =	112.20
Painting and lining per annum, - - =	28.00
Contingent repairs, annually, - - =	5.00
Empty cars, their wear and tear, per car in constant use, 5 per ct. of the preceding amounts.	11.36
Interest on $700, the prime cost of car or coach in constant use. - - - -	42.00
Interest on 2 spare coaches for each coach in constant use. - - - -	84.00
Annual charge for each passenger coach in constant use. - - - - =	$364.47

Being, as nearly as may be, $1, per day.

Or, for 80 miles in a day, $1\frac{1}{4}$ cents per mile.

Daily cost of each Locomotive Engine in use 312 days in the year, to be employed in the transit of commodities between Baltimore and Washington, and running 80 miles per day or 10 hours at 8 miles per hour.

	$
Engineer, per day - - - -	2.00
Assistant - - - - -	1.00
$1\frac{1}{2}$ tons anthracite coal at $7 - - -	10.50
Repairs and renewals of engine and tender -	5.85
2 spare engines and tenders, interest - -	1.67
Total cost per day = - -	$21.02

Equal to $26\frac{275}{1000}$ cents per mile.

Resistance and effective power of traction.

Having estimated the probable expense of cars and the Locomotive Engine employed in the conveyance of commodities it remains to assign the load or performance of the engine, and to do this, we must first estimate the amount of the resistances to be overcome.

The greatest ascent admitted on the li of the Washington railway is that of 20 feet to the mile, or n264, the resistance from gravity upon which is $\frac{2240}{261} = 8\frac{1}{2}$ lb. per ton. The greatest curvature allowed on that ascent may be of a radius of 3016 feet, whilst the least radius of curvature upon the line is 1273 feet; the latter however occurs but in two instances and for short distances near the Patapsco, and on a perfectly horizontal grade. The resistance per ton upon the former curvature and the ascent, and likewise upon the latter curvature and the horizontal grade, will now be estimated and compared.

It has been satisfactorily determined from various experiments made upon the Baltimore and Ohio rail road that the resistance to the motive power opposed by a curvature of 400 feet radius is as nearly as may be 50 per cent of the resistance upon a straight part of the road, both being horizontal. That is to say, the resistance in the straight road being 10 lb. that in the curve of 400 feet radius is 15 lb.: And that in general the resistance from curvature is inversely as the radius. Consequently, in a curve of 200 feet radius the resistance is doubled, or 20 lb., when it is 10 lb. in the straight road. The formula for the increase of power required to overcome the resistance from curvature, in moderate velocities, will therefore be, $\frac{200\,P}{R}$ wherein $P =$ the power required on a level and $R =$ the radius of curvature. The wheels in use upon the Baltimore and Ohio rail road are "cylindro-conical," and with such wheels were the experiments made. It was found that whether we employed the Winan car with its friction wheels and vibrating axle, or the chilled-box car without the vibration, the ratio of retardation from curvature was the same: viz. in a curve of 400 feet radius 50 per cent of the force required to impel the respective car on a horizontal part of the railway.

The railway and cars being in good condition and the wheels 30 inches in diameter, the traction with the Winan car upon a horizontal straight railway is about the $\frac{1}{400}$ and that of the common chilled-box car, with outside bearings, the $\frac{1}{240}$ but in making the calculation, it may be proper to add something for a contingent power to overcome the action of winds, and the effects of unavoidable imperfections.

Calculation for the Winan Car.

On the straight level road $\frac{2240}{400} =$ per ton - -	5.6
On a level curved with 1273 feet radius $\frac{200 \times 5.6}{1273}$	.9

Add for contingent power	1.5
And the greatest power of traction required on a level upon the Washington railway, is, per ton	= 8.0

When the ascent is 1 in 264 and curve 3016 feet radius it will be:

	lb.
On the level and straight $\frac{2240}{400}$ = per ton	5.6
Curvature $\frac{200 \times 5.6}{3016}$	.4
Add for contingent power	1.5
Ascent 1 in 264, gives $\frac{2240}{264}$ = per ton	8.5
And the greatest power of traction required with the Winan car on any part of the Washington railway is	16.0

Calculation for the Chilled-box Car.

When the way is level, but curved with 1273 feet radius.

On the level and straight $\frac{2240}{240}$ = per ton	9.3
Curvature $\frac{200 \times 9.3}{1273}$ = per ton	1.5
Add for contingent power per ton	1.5
Power required on the level with this car =	12.3

Way ascending 1 in 264 and curved with 3016 feet radius then:

On the level and straight $\frac{2240}{240}$ = per ton	9.3
Curvature $\frac{200 \times 9.3}{3016}$	.7
Add for contingent power	1.5
Gravity on ascent of 1 in 264 gives $\frac{2240}{264}$ =	8.5
Maximum power of traction required on the Washington railway with the chilled-box cars	= 20.0

There is no part of the Baltimore and Ohio railway between the first depot at Pratt street, and the commencement of the branch to Washington that exceeds an ascent of 20 feet per mile, yet upon a grade of this rise near the first crossing of the Washington turnpike, and likewise upon a similar grade approaching the Deep cut, the curvature has a radius of about 1000 feet for a short distance at each place: here the resistance is about one pound per ton greater than it will be upon those portions of the Washington branch requiring the greatest power. From the limited extent, however, of the parts of the Baltimore and Ohio railway here mentioned no doubt is entertained but that by means of the momentum they will be easily passed by a Locomotive on its way to Washington with a train that will be a full load on the Washington branch. From the Patapsco to Baltimore the ascents in the cuts do not exceed 17 feet per mile. Consequently, whether in passing from Baltimore to Washington, or the reverse, the maximum power of traction per ton with the Winan car will be 16 lb. and with the common car, 20 lb.

Of the power of the Locomotive Engine.

Experience on the Baltimore and Ohio rail road has demonstrated that a sufficiency of steam is readily and constantly generated with anthracite coal for the full action at 15 miles per hour, of the Locomotive Engine of 6½ tons weight with 4 tons on the two adhesion wheels, and that, inclusive of unavoidable imperfections, the adhesion, and consequently the power of traction of the Locomotive is $\frac{1}{8}$ of the weight bearing upon the rails through the adhesion wheels, when the rails are in good condition for adhesion, and being, in this case equal to one eighth of 4 tons, or half a ton; that is, 1120 lb. upon a level. This power of traction is exclusive of that necessary to impel the engine and tender, weighing together 11½ tons, upon a level straight road. The traction of 1120 lb. will therefore be lessened by the resistance from curvature and gravity of the engine and tender, as follows:

		lb.
Resistance from curvature	$= .7 \times 11\frac{1}{2} =$	8
Do. from gravity	$= .8\frac{1}{2} \times 11\frac{1}{2} =$	97
Total	=	105

		lb.
Power of traction on a level straight road, =		1120
Greatest retardation from curvature and gravity of Engine and Tender on Washington railway,	=	105
Effective power of traction on those parts of the railway offering the greater resistance, -	=	1015

Therefore the full load for such an engine on the Washington railway, when the winan cars compose the train. will be, $\frac{1015}{16} =$ - - - - $63\frac{1}{2}$ tons,

And when the common cars are used, $\frac{1015}{20} =$ $50\frac{3}{4}$ tons,

Assuming, as the most economical arrangement, the weight of each car to be $1\frac{1}{4}$ tons, and the freight 3 tons, the gross weight of each laden car will be $4\frac{1}{4}$ tons.

Hence with the winan cars, the number in the train will be $\frac{63\frac{1}{2}}{4\frac{1}{4}} =$ - - - - 15 cars,

And with common cars, the number $= \frac{50\frac{3}{4}}{4\frac{1}{4}} =$ 12 cars,

Of the conveyance of Commodities.

In estimating the wear and tear, we assumed that about one third of the number of cars in motion would probably be empty; and it becomes necessary to extend the like assumption to the estimate of the expenditure of power. Therefore, and to allow for the somewhat greater weight of the friction car, each train on an average may be composed as follows:

With friction cars, 6 empty, and 12 laden with goods = 36 tons,
With common cars, 5 empty, and 10 laden with goods = 30 tons,

The useful effect of a Locomotive engaged in the transit of commodities between Baltimore and Washington, at a speed of 8 miles per hour for 10 hours in a day, going and returning daily will be, with the friction car, 36 tons of goods carried 80 miles equal to 2880 tons 1 mile in a day. And with the common car 30 tons of goods 80 miles, equal to 2400 tons 1 mile in a day.—And since the expense of the Locomotive power is estimated at $21.02, wherefore when the train is of friction cars, the Locomotive expenses $= \frac{2102}{2880} = .7299$ cents or nearly $\frac{3}{4}$ of a cent per ton per mile; and when the train is of common cars, the cost is $\frac{2102}{2400} = .8758$ cents, or $\frac{7}{8}$ of a cent per ton per mile.

The friction car is more expensive in construction and repair than the common one, and its relative efficiency decreases with the increase of the ascents of the road, since the retarding force of gravity is constant for the same weight with either car; yet, it is probable that of the two kinds, the friction car will be rather the most economical upon a line, the ascents of which do not exceed those of the Washington railway. We shall, notwithstanding, continue the estimate upon the use of the common car.

The transportation of commodities must be taxed with a proportion of the general expenses. These will consist in the salaries of the superintendent of transportation and clerks, and the annual expenses consequent upon depots, sheds, water stations, and interest of capital invested in these buildings and works. Perhaps $10,000 per annum may cover these expenditures; and if this sum be apportioned amongst 4 Locomotive Engines constantly at work, being two for freight and two for passengers, each Engine must be taxed with $2,500 per annum. For the Engine engaged in the transit of goods this is $8 per day for the year of 312 days, and for that employed in the conveyance of persons the rate is $6,85 per day for the year of 365 days. Should more than 4 Engines be employed in constant use, as will probably be the case, the general expenditure for each will be lessened, but we shall not now venture upon a reduction of this branch of expenditure.

Then the cost of transit per ton of goods per mile according to the preceding estimates will be,

	of a cent
For the expense of cars, - - -	.2030
For Locomotive Engine expenses - -	.8758
For general expenses, $\frac{800}{2400} = \frac{1}{3}$ of a cent, =	.3333
	1.4121

The last item will decrease as the quantum of trade and intercourse shall augment, and the first and second items, but especially the latter, will be diminished as improvements shall be made in the machinery, and as fuel shall become cheaper. It is fully believed that deductions will take place in each one of these items, so that, ultimately, and perhaps in a short space of time, the total expense per ton per mile will be only 1 cent instead of 1 $\frac{4121}{10000}$ cents as now estimated. Moreover it is probable that the customary and legal charges for receipt and delivery, weighing and storing, &c. will expunge fully one half of the latter item of expense amounting, as estimated, to .3333 of a cent per ton a mile. The half of this is .1667, and deducting it from 1.4121 leaves 1.2454 cents, or very nearly $1\frac{1}{4}$ cents per ton per mile, as the probable actual cost of the conveyance of goods, at the same time yielding interest at 6 per cent per annum, upon the capital invested in the machinery and motive power. For abundant caution, however, in these estimates of the rusults of the future, we shall retain the total 1.4121 cents, as the cost per ton of goods per mile.

The daily expenses per train.

It has been shown that the annual cost per car will be $152. or for the year of 312 days, the daily cost will be $48\frac{72}{100}$ cents = $0.4872, and the cost per train of 10 cars per day = $4.87.

Therefore.

		$
Daily cost of Locomotive Engine, -	=	21.02
do. of train of 10 cars, - -	=	4.87
do. general expenses, - -	=	8.00
Total daily cost per train. - - -	=	$33.89

The train will perform daily a circular trip between the two cities distant, say 40 miles, equal to 80 miles in the day, carrying 30 tons of freight, equal to 2400 tons 1 mile for .3389 cents, and $\frac{3389}{2400}$ = 1.4121 cents per ton per mile as already stated in another way.

There being several routes for the proposed railway to be compared with each other as to their relative fitness to be chosen, and as the expense per ton per mile and the daily expense will be various upon them, it becomes expedient to make the statements of the cost of transit conform to a rule or ratio that shall apply, as nearly as may be, accurately and justly to each several route, setting out with the estimated actual cost upon some one of them, as No. 1. for instance. We have already estimated the daily expenses of a train, that is, the expenses of a train making a trip, circular. Now some portion of the expenses depend upon actual length of road, ascents, and curvature, whilst other portions will be constant whatever route may be adopted. The cost of fuel will be as the power required, or as the distance equated to a level straight road, allowing for ascents and curvatures, whilst the wear and tear will be as the actual distance corrected for curvature: In the wear and tear is included the expense of oil and the interest on the prime cost of the car or engine. It is true, strictly speaking, that the mechanical power required upon descents will be much less than upon ascents, yet the fire must be kept up and the steam generated in order that it may be commanded in full pressure at the ascents: The steam will therefore be blown off when not wanted, and the expenditure of fuel will be increased beyond that required for a straight level road very nearly in proportion to the ascents and curvatures. The wear and tear will be about the same on ascents and descents as on the level parts of the road for equal distances, since the pressure upon the rails will be almost the same and the number of revolutions precisely so. The wear and tear will however be increased by the curvatures perhaps very nearly in the ratio of the increased power of traction required to overcome them, consequently, the wear and tear will be proportional to the actual distance increased for curvature. The interest on spare cars and spare locomotive engines and tenders, the pay of the engineer and his assistant, and the general expenses of depots, salaries, water stations, &c. will be the same on any of the routes; since upon any one of them the circular trip would be made in a day with the same train.

The analysis of $33.89, the expenses per train for each circular trip, will therefore be as follows:

1. Expense that will be proportional to actual distance, ascents, and curvatures.		$
Fuel, - - - - -		10.50
2. Expense that will be proportional to actual distance and curvature.		
Wear and tear of Locomotive Engine and tender, - - - - - -	$5.85	
Wear and tear of the train of 10 laden cars, - - - - - -	3.72	
	———	9.57
3. Expenses that will be the same upon any of the routes.		
Engineer, assistant, and interest on prime cost of spare engines and tenders, = -	4.67	
Interest on prime cost of 40 spare cars for 10 laden cars in the train, = -	1.15	
General expenses, for salaries, depots, &c. &c. = - - - - -	8.00	
	———	13.82
Total cost of each train per circular trip, =		$33.89

In order to apportion all of the foregoing kinds of estimated expenditure to the several routes, according to their lengths and attributes of grade and curvature, respect will be had to the peculiarities in these particulars of each route. The maximum grade upon each route is the same, viz: 20 feet per mile = 1 in 264, and so is the maximum curvature upon that grade, being 3016 feet radius; hence the tonnage or number of cars per train will be equal upon the several routes. The altitudes of the summits to be passed upon them, however, are different, the curvatures are various, and so are the distances, or actual measured lengths of the routes. We shall now proceed with the preliminary steps necessary to assign to each route the probable expenses of the motive power upon it, viz: the equation of the ascents and curvatures to their values in horizontal straight lines.

Annexed is a table of grades, marked No. 5, and comprehending the ascents, descents, and summits, upon the twelve several routes; there is likewise annexed, a table No. 6, of the curvatures, showing the degrees and minutes of deflection at each 100 feet upon the curved alignements, the radius of curvature, the total length of right alignements or tangent lines, the lengths of curved alignements, and the equation, or distance to be added to the actual measured distance as an allowance for the disadvantage of the curvatures made out according to the formula $\frac{200\ d}{R}$, d being the distance as actually measured, and R the radius of curvature. All the measures of length in this table are in feet.

Compiled from these two, and annexed, is Table No. 7, exhibiting in successive columns, the No. of the route, the actual measured distance in miles and decimal parts, the sum of the heights, in feet to be surmounted in passing from New Jersey Avenue, in the city of Washington, to the intersection with the Baltimore and Ohio Rail Road, at the distance upon the latter of 6 miles from the first depot, (or about 7 miles from the depot within the city of Baltimore, at the intersection of Charles and Camden streets,) the sum of the heights to be encountered in passing from the said intersection with the Baltimore and Ohio Rail Road, to New Jersey Avenue, a column of the averages of these heights in feet and decimal parts, a column of the equation in miles due to these average heights, allowing 264 feet horizontal, for 1 foot of altitude, a column of the equation for curvature, in miles, or decimal parts of a mile, a column of the distances corrected for curvature, and lastly, a column of the distances corrected for both heights and curvatures. The latter column therefore expresses the lengths of the several routes equated to a straight and horizontal road.

The results of the last mentioned table will enable us to apply the estimates of the cost of motive power to each route, proportionally.

It will be necessary, however, in the calculations relative to the motive power and machinery, to add to the distances upon each route in the last recited table, as common alike to all of the routes, the 6 miles of actual distance on the Baltimore and Ohio Rail Road, from the point of intersection to the first depot, with the corrections for curvatures and ascents upon the same, inasmuch as the Engine in the performance of each trip from city to city, will traverse this part of the Baltimore and Ohio Rail Road as well as the branch to Washington. Now the summits in the cuts upon these 6 miles, amount in the aggregate to 17 $\frac{320}{1000}$ feet, averaging both directions, being equal to an increase of 0.8660 miles of distance. Moreover, parts of the distance equal to 2.4351 miles are curved, and from calculation the increase of distance due to the curvatures is found to be 0.3464 miles. (For grades and curvatures, see Table D. 5th Annual Report, Baltimore and Ohio Rail Road company.) Hence the distance increased for curvature is 6.3464 miles, and increased for both grade and curvature, 7.2124 miles.

These distances being added to those of a corresponding character in the last mentioned table, the necessary calculations of the expense attendant upon one, two, three and four trains, each consisting of one Locomotive and tender, and 10 cars laden with freight in the performance of a circular trip, between the cities of Washington and Baltimore, upon each route have been made, and the results are embodied in Table No. 8. annexed.

The expense of fuel will be proportional to the distances in the 4th column of this table. Thus, estimating at $10.50 as we have done, the expense of fuel per circular trip, upon route No. 1, having a distance equated for grade and curvature of 48.0545 miles, the charge for fuel upon route No. 2, with an equated distance of 48.2179 miles, will result from the proportion 48.0545 : 48.2179 : : $10.50 : $10.5359; and by similar calculations the cost of fuel is assigned for each route. The wear and tear will be proportional to the distances in the third column, and the expenses in the sixth column have been estimated accordingly. The expense of attendants, interest on prime cost of spare Engines, tenders, and cars, will be uniform upon all the routes, and column 7th is so composed.

The sums in the columns of annual expense of one and two trains, contain, it will be recollected, a charge of $2500 per train for general expenses, consisting of salaries, depot expenses, &c. &c. taxed on the supposition that the motive power employed in the transit of commodities must pay $5000 of expenses of this character; and for two trains; the number that will doubtless be required as soon as the railway shall be opened, the sum allotted to each would be $2500. When three trains shall be employed, however, these expenditures will probably not be increased, but will be divided into three equal parts, so that each train will pay $1666.67, being $833.33 less than in the former case, and a deduction for this amount is made in calculating the annual expenses of 3 trains, as in column 11th. The 12th column contains the annual expenses of 4 trains, in which, upon the same principle, a deduction, per train, of $1250, is made. Four other columns are added, showing the capital in present money upon each of the twelve routes, equivalent to these expenses in perpetuity.

Of the Conveyance of Passengers.

The Locomotive Engine already described, will be competent to convey upon the contemplated railway, when the rails are in good condition for adhesion, a gross tonnage equal to 50¾ tons, as has been shown. The gross weight of a passenger car containing from 16 to 18 persons is about 2¾ tons, consequently the engine would travel with a train of 18 such cars containing 300 persons. The supply of steam, however, would probably not be sufficient, with such a train, to maintain a speed over 12 or 15 miles per hour, whilst in motion. This is not a sufficiently high velocity for the Washington and Baltimore railway: besides, if the engine were capable of leading a train containing 300 passengers at the desired velocity, it would not have constant employment upon such a scale, as so great a number of passengers at one time would seldom offer. The fact, nevertheless, that so many persons could be conveyed at once by a single engine, even at the rate of 12 miles the hour, sufficiently demonstrates the advantages in power and celerity afforded by the railway system over any other mode hitherto known of conveyance upon land.

It is not improbable that, ultimately, 100 persons will be the usual number conveyed in a train; with these the speed may be as great as will comport with comfort and safety; especially in the summer season, when, upon emergencies twice that number could be carried, apparently with equal ease and facility. (The probable performance in winter is hereinafter investigated in connection with the time to be consumed in making a trip.) Supposing 6 cars to accommodate 100 persons, and that two other cars shall be added, to allow for wear and tear of cars partly filled, and for baggage, the train will then consist of 8 cars, the expense of the wear and tear of which, with the interest on spare cars has been herein before estimated at $1 per day or per circular trip for each car. The wear and tear, or repairs and renewals of the engine and tender engaged in this service, we have estimated at $8.15 per day, and the general expenses, such as for salaries, depots, water stations, &c. at $6.85 per day for each engine in operation. In the estimate for the daily expenses of an engine running with goods we set down $1 for the pay of the assistant to the Engineer: but we shall here charge $1.50, in order that a person may be employed who shall be capable, when required, of managing the engine in the capacity of Engineer. The estimate will therefore be as follows:

Daily expense of a Locomotive Engine and train conveying 100 passengers between Baltimore and Washington one circular trip each day.

	$
Engineer, wages - - - -	2.00
Assistant, do - - - -	1.50
$1\frac{1}{2}$ tons anthracite coal at $7 - -	10.50
Repairs and renewals of engine and tender -	8.15
2 spare engines and tenders, interest - -	1.67
Total for engine and tender = - -	$23.82
8 coaches at $1 - - - -	8.00
Conductor, wages - - - -	2.00
General expenses - - - -	6.85
Total per day - - - -	$40.67

And $\frac{4067}{100} = 40\frac{2}{3}$ cents per passenger for the circular trip, or for the single passage between the cities $20\frac{1}{3}$ cents, or very little over half a cent per mile. Adding for conveyance into the city from the engine station, the cost of conveyance per person, will be about 24 cents.

One engine according to the foregoing arrangement would therefore convey, daily, 200 passengers and 2 engines 400 passengers, from city to city: and the time employed in performing the transit would be $2\frac{1}{2}$ hours according to the speed constantly maintained upon the Newcastle and Frenchtown railway across the peninsula between the Cheapeake and Delaware bays, or the velocity might be made to average 19 to 20 miles per hour, and the trip be performed in *two hours* only.

It is probable, however, that the public convenience and exigencies will be better accommodated in the running of three instead of two engines, daily, for the conveyance of passengers, although the number should not exceed 200 per day in each direction, one of the trains besides its quota of persons might carry the principal mails at such time within each 24 hours as the General Government should require. This arrangement would, by lessening the number of passengers in each train, enhance the cost to the company of their conveyance; yet, without doubt, the government would pay a just compensation for the speedy and safe carriage of the enormously bulky mails that must ever pass upon this route. The renumeration thus to be received from the post office department will probably more than counterbalance the excess of cost in the conveyance of the passengers. Upon this plan the following will be the estimate for the same number of passengers, viz: 400 daily, that is, 200 in each direction, or for any number of trains conveying each 67 passengers. As 1½ tons of anthracite coal is considered a very full allowance for the conveyance of the 8 coaches, 1¼ tons will now be assumed as sufficient for the lighter trains.*

Daily expense of a Locomotive Engine and train conveying 67 passengers one circular trip each day between Washington and Baltimore, viz:

	$
Engineer, wages,	2.00
Assistant, wages	1.50
1¼ tons anthracite coal at $7	8.75
Repairs and renewals of engine and tender	8.15
2 spare engines and tenders, per engine in use, interest	1.67
Total per engine and tender =	$22.07
6 coaches, at $1	6.00
Conductor, wages	2.00
General expenses	6.85
Total per day	$36.92

The item of general expenses, $6.85, is predicated upon the use of two trains in motion; and would be reduced to $4.57, with 3 trains; but for safety in the estimate, it being somewhat uncertain whether the general expenses will not increase with an increase in the number of trains for the conveyance of passengers, though not proportionally, the reduction is not now made.

We have therefore 67 persons carried the circular trip for .3692 cents, being 55 cents each, equal to 27½ cents for the single trip from one to the other city; and allowing, as before, for conveyance with horses within the improved parts of the city (the same coaches to be used, the wear and tear of which being already estimated,) the cost per person will be perhaps 31 cents, being about $\frac{8}{10}$ of a cent per mile; and about 25 per cent more costly with 3 than with 2 engines in use.

The application to the different routes, of the foregoing estimate of the cost of each train in the conveyance of passengers, as was done in regard to the expenses of a train in the transit of commodities, will be effected by means of a similar analysis, as follows:

---

* We have received from the Superintendent of machinery the information that the Atlantic engine has run upon the Baltimore and Ohio Railway 13,280 miles and consumed 190 tons of anthracite coal, being at the rate of one ton upon a journey of 70 miles, or $1\frac{1}{7}$ tons upon 80 miles The average load was probably equal to that of 7 coaches with passengers, and the consumption of coal about one pound per mile per ton inclusive of the weight of the engine and tender. The coal consumed in getting up the steam being included, no doubt can therefore be entertained of the adequacy of our estimates as to the quantity of fuel.

1. Expenses that will be as the actual distance corrected for ascent and curvature: viz:		$
Fuel - - - - - -		8.75
2. Expenses that will be as the actual distance, corrected for curvature, only: viz:		
Wear and tear of locomotive engine and tender - - - -	$8.15	
Wear and tear of the train of 6 coaches, at 77 cents each - - -	4.62	
		12.77
3. Expenses that will be of equal amount on any of the routes: viz:		
Engineer, assistant, and interest on prime cost of 2 spare engines and tenders for each engine in operation -	5.17	
Interest on prime cost of 12 spare coaches for 6 in use - - -	1.38	
Conductor's wages - - -	2.00	
General expenses - - -	6.85	
		15.40
Total cost of each train per day or per circular trip, as before,		=$36.92

As was done in regard to the conveyance of freight, so in relation to the trains with passengers, we have made the necessary estimates of the cost of motive power and machinery, and apportioned every part of the same upon rigid principles amongst the different routes, for 1, 2, 3, and 4 trains, and the results are contained in Table 9, annexed.

V. *The Comparison of the Twelve Routes.*

We have combined in Table 10, also hereto annexed, the results of the preceding calculations and estimates, with regard to *construction*, *repairs and renewals*, and *motive power and machinery*, upon each one of the 12 different routes; and for clearer elucidation, have divided this table into two series, the one first in order being of the 6 routes, numbered 1, 3, 5, 7, 9, and 11, that cross the Patapsco river near to, and just below, Dennis A. Smith's bridge; whilst the second is of the 6 routes numbered 2, 4, 6, 8, 10, and 12, that cross the same river at the Hockley Mill. Although the transit of commodities as well as of persons arriving at, and departing from, Baltimore, will pass along the entire distance between the depot at Charles and Camden streets near the basin in that city, and New Jersey Avenue in the city of Washington, (or such other points within the improved parts of the two cities as may hereafter be fixed upon,) yet the operations of the Locomotive Engines will probably be confined to the space between New Jersey avenue and the first depot established by the Baltimore and Ohio Rail Road company on Pratt street. With a view to this arrangement the table is framed, and accordingly the distance upon the Baltimore and Ohio Rail Road to be traversed by steam power in passing to and from Washington upon the several routes by D. A. Smith's bridge, is 6 miles; whilst upon the routes by Hockley Mill, it is $6 \frac{9883}{10000}$ miles, or 7 miles *less* 62 feet. The distance within the city of Baltimore, and between the depots mentioned is 4972 feet $= \frac{9417}{10000}$ of a mile, and will be traversed with horse power. The entire distance used upon the Baltimore and Ohio Rail Road, in the transit between Baltimore and Washington, counting from the depot near the basin, at Charles and Camden streets, will then be, if the route by Smith's bridge were adopted, 6.9417 miles; but upon the route by Hockley Mill 7.9300 miles. The table, however, is confined to the comparison of so much of the distances upon each route as will be the theatre of steam power; and contains, in relation to each of the 12 routes, the following particulars, viz: The distance to be occupied upon the Baltimore and Ohio Rail Road; the distance to be traversed upon the proposed lateral Rail-road to Washington, and the total distance; the estimated probable cost of construction of the masonry, graduation, and railway, respectively; the estimated probable cost of the extraordinary repairs of the graduation to be effected within the first five years after construction, and of the ordinary annual repairs of the graduation and masonry in perpetuity; likewise of the average annual repairs and renewals of the double railway in perpetuity; to all of which there is added the estimated probable annual expense attendant upon the running of 1, 2, 3, and 4, Locomotive Engines and trains both for the conveyance of commodities and persons. The first column down to the cost of the railway, inclusive, contains the sums of actual capital to be expended in the construction of the masonry and bridging, of the graduation, and of the railway, respectively; the next item in this column, is the amount of capital to be actually expended in the extraordinary repairs, and so soon after the formation of the road, that the amount is treated as so much of actual capital to be expended in completing or perfecting the construction; the annual interest of the cost of these repairs is, consequently, considered in the same light as a charge upon the concern to be provided for, as is the interest arising from the actual expenditures in the construction in general. So far the 1st column contains the capital actually to be expended. What follows, however, is not capital *expended* as such, but only sums of *consequential* or *equivalent* capital; that is to say, amounts that if placed at 6 per cent. interest, would annually produce incomes equivalent to the actual annual expenses set opposite to them in the 2d column. It was not absolutely necessary, in order to effect the intended comparison of the routes, to annex, after the capital actually to be laid out; these sums of *equivalent capital*, since the 2d and 4th columns contain the needful elements in the form of annual interest and expenditure; but inasmuch as, in the form of capital in present money, the elements of comparison become, as it were, magnified, whilst in that form, they still equally preserve the fidelity of truth, it is thought to be relevant and proper to present the items of comparison under both forms. The 2d column, as has just been intimated, contains the annual interest at 6 per cent. of the capital to be actually expended in the constructions, and in effectuating the extraordinary repairs; together with the probable annual cost of the repairs of the masonry and the graduation, and of the average annual repairs and renewals of the double railway, and likewise of the probable annual cost of the motive power and machinery inclusive of salaries, depot, and other consequent and contingent expenses, with 1, 2, 3, and 4 engines and trains, as already mentioned. The 3d column contains the sums total of the 1st column, and the 4th the sums total of the 2d. The like is observable of the whole 12 sets of 4 columns each that compose the table.

This table enables us to make the following comparisons, viz:

The Routes by D. A. Smith's Bridge, and by Hockley Mill compared.

Of the total amounts of the estimates for construction of the masonry and bridging, graduation, and double railway, and the interest upon the same.

	Interest.		Actual capital to be expended.
	$		$
No. 1. Upper route by Smith's bridge,	88,029.66	=	1,467,161
No. 2. Upper route by Hockley Mill,	87,593.76	=	1,459,896
Differences in favor of the latter, =	435.90	=	7,265
No. 3. Lowermost route by S. bridge,	85,786.74	=	1,429,779
No. 4. Lowermost route by Hoc. Mill,	85,350.78	=	1,422,513
	435.96	=	7,266

No. 5. Clark route by Smith's bridge, 91,016.40 = 1,516,940
No. 6. Clark route by Hockley Mill, 90,580.44 = 1,509,674

435.96 = 7,266

No. 7. Mill route by Smith's bridge, 90,270.00 = 1,504,500
No. 8. Mill route by Hockley Mill, 89,834.16 = 1,497,236

435.84 = 7,264

No. 9. Hall route by Smith's bridge, 92,349.72 = 1,539,162
No. 10. Hall route by Hockley Mill, 91,913.94 = 1,531,899

435.78 = 7,263

No. 11. Intermediate route by S. bridge, 85,879.68 = 1,431,328
No. 12. Intermediate route by H. Mill, 85,443.72 = 1,424,062

435.96 = 7,266

In the foregoing comparisons the differences of the annual interest should, in every statement, be exactly alike, and so should the differences of capital; the variation; however, is very slight, and arises wholly from employing or rejecting small fractions of a dollar in excess or defect in the amonnts of capital. The same remarks will apply to the differences in the statements that follow.

It appears, therefore, (adopting the differences of the first statement as an average,) that upon the total cost of construction the several routes passing Hockley Mill, will be less expensive than those passing Smith's bridge, by an annuity of $435.96, or an expended capital of $7,266.

Taking into view, in addition to the cost of construction, all of the repairs and renewals of masonry, bridging, graduation, and railway, the comparison will be as follows:

Annual interest and expense. — Actual and equiv't. cap'l.
$ — $

No. 1. Upper route by Smith's bridge, 113,098.36 = 1,884,972
No. 2. Upper route by Hockley mill, 112,127.45 = 1,868,791

970.91 = 16,181

No. 3. Lowermost route by S. bridge, 110,946.27 = 1,849,105
No. 4. Lowermost route by H. mill, 109,975.17 = 1,832,920

971.10 = 16,185

No. 5. Clark route by Smith's bridge, 116,869.25 = 1,947,821
No. 6. Clark route by Hockley mill, 115,898.09 = 1,931,635

971.16 = 16,186

No. 7. Mill route by Smith's bridge,	115,940.19 =	1,932,336
No. 8. Mill route by Hockley mill,	114,969.20 =	1,916,153
	970.99 =	16,183
No. 9. Hall route by Smith's bridge,	118,828.86 =	1,980,481
No. 10 Hall route by Hockley mill,	117,857.93 =	1,964,299
	970.93 =	16,182
No. 11. Intermediate route by S. bridge,	111,108.70 =	1,851,811
No. 12. Intermediate route by H. mill,	110,137.61 =	1,835,627
	971.09 =	16,184

Wherefore, in this stage of the comparison, the routes by Hockley mill have the advantage by an annuity of, say $970.90, or an equivalent of capital in present money equal to $16,181.

In a special report in relation to the routes by Smith's bridge and Hockley mill made by me on the 24th of May last at thy request, and to enable the Board to decide upon which route to construct the viaduct bridge across the Patapsco, it was, upon like elements of comparison with the foregoing, estimated, that the difference in favor of the route by Hockley mill would be equal to an annuity of $1058.06, or of a capital of $17,634.41. The difference arises principally from certain slight variations in the elements of repairs, that a further consideration induced to be employed. But the advantage of the Hockley mill route has been more fully developed in the recent surveys upon the 1st division that have been made in the course of adjustment and preparation of the line for contract, by which a difference in favor of this route will be realised of probably not less than $30,000.

Including in the comparison the expense of the motive power and machinery to the extent carried in the table, the results will be as stated below:

	Annual interest and charges.	Actual and equiv't. cap'l.
	$	$
No. 1. Upper route by Smith's bridge,	207,212.95 =	3,453,550
No. 2. Upper route by Hockley mill,	206,995.92 =	3,449,932
	217.03 =	3,618
No. 3. Lowermost route by S. bridge,	207,848.26 =	3,464,139
No. 4. Lowermost route by Hock. mill,	207,631.16 =	3,460,521
	217.10 =	3,618

No. 5. Clark route by Smith's bridge,	213,501.96	=	3,558,366
No. 6. Clark route by Hockley mill,	213,284.56	=	3,554,745
	217.40	=	3,621
No. 7. Mill route by Smith's bridge,	211,924.26	=	3,532,070
No. 8. Mill route by Hockley mill,	211,707.43	=	3,528,458
	216.83	=	3,612
No. 9. Hall route by Smith's bridge,	214,805.05	=	3,580,087
No. 10. Hall route by Hockley mill,	214,588.40	=	3,576,476
	216.65	=	3,611
No. 11. Intermediate route by S. bridge,	207,757.21	=	3,462,620
No. 12. Intermediate route by H. mill,	207,540.04	=	3,459,001
	217.17	=	3,619

It follows from the comparisons just made, that with a trade and intercourse involving the constant employment of 4 engines in the conveyance of commodities and as many in the transit of persons, each making a circular trip daily, an advantage would still exist in favor of the route by Hockley mill; the difference being an annuity of $217.03, or a capital of $3,618. We have no doubt that upon the opening of the road, the operation of 2 engines for goods and 2, or most probably 3, for passengers will be in immediate demand; that by the time the 2nd track shall be laid, 3 and possibly 4 of each may be required: The probability at least is, that many years cannot elapse before there will be constant employment for the latter number of Locomotive Engines upon this important line of intercommunication. Commanding as the position of this road certainly is, it may, however be doubted whether more than 4 of each in constant use, that is, whether more than 8 circular trips per day, will be required; or at least it may be presumed, that, in any event, the epoch is so remote at which so enlarged a business shall exist as to justify us in not providing for it in the estimates of the present day.

Independent of the final differences, that upon calculations and estimates of a nature deemed full and complete, have been found to exist, as above stated, in favor of the routes crossing at Hockley mill, there are other considerations of such a nature and weight, if the scales of the balance were otherwise equipoised, or nearly so, that would be decisive.

One of these as has been already mentioned, is that the advantage in favor of the route by Hockley mill, as respects construction and repairs, will most probably be $30,000 instead of $16.181, as estimated: and this arises principally from the advantage taken of the greater elevation at Hockley mill in laying the line upon a higher level in its advance and approach to the summit at Merrill's ridge. Another is, that the curvatures of less radii than 1273 feet existing upon those parts of the Baltimore and Ohio Rail Road embraced in the routes by Hockley mill, may easily, upon occasion of future repairs, and if then thought needful, be enlarged to a radius of 1273 feet. A third consideration is, that in the course of repairs, the ditches and excavation at vinegar hill will become widened so that the summit of 5 feet at that place, and which, in the estimates, has been taxed upon the Hockley mill routes, can, and probably will, be removed; and this would effectively gain an advantage in the distance of one fourth of a mile as regards the moving power. Moreover, the charge upon the transit of granite and of lime from the ravine of the Patapsco, in passing to Washington, or to any point of destination upon the lateral road less remote, will be about 6 cents per ton less upon a route by H. mill than upon a route by S. bridge; and a tariff of even this small amount, equal to 4 per cent of the charge per toll and transportation to Washington, may be an object, and even decisive, in competing with the proprietors of quarries and kilns in other parts of the country, and consequently, it may affect the interests of the railroad. Lastly, since the lateral road upon a route crossing the Patapsco at Hockley mill will be shorter than upon a route crossing near Smith's bridge, by $= \frac{3552}{10000}$ of a mile, or 1875 feet, it is presumable that the damages for lands and fencing will be less upon the former than upon the latter.

All of the routes therefore, that cross the Patapsco river near D. A. Smith's bridge, and numbered 1. 3. 5. 7. 9. and 11, and which are the subjects of the first series in the last mentioned table, will be *rejected;* and the future comparisons will regard those routes only that cross at Hockley mill, numbered 2. 4. 6. 8. 10. and 12, and constituting the 2nd series in that table. From amongst these six, the final choice of a route for the proposed railway, must therefore be made.

The routes by Hockley Mill compared with each other.

Referring to the table (No. 10) we find as follows:

Upon construction.	*Annuity.*		*Capital.*
	$		$
No. 2. Upper route -	87,593.76	=	1,459,896
No. 4. Lowermost route	85,350.78	=	1,422,513
No. 6. Clarke route -	90,580.44	=	1,509,674
No. 8. Mill route -	89,834.16	=	1,497,236
No. 10. Hall route -	91,913.94	=	1,531,899
No. 12. Intermediate route	85,443.72	=	1,424,062

In regard to the construction alone, No. 4 is the least and No. 10 the most costly and the preference will range according to the following order, viz:

4. 12. 2. 8. 6. 10.

	Annuity. $		*Capital.* $
Than No. 4			
No. 12 is most costly by	92.94	=	1,549
No. 2 - by	2,422.98	=	37,383
No. 8 - by	4,483.38	=	74,723
No. 6 - by	5,229.66	=	87,161
No. 10 - by	6,563.16	=	109,386

Including with construction, the probably cost of repairs and renewals of masonry, graduation, and railway, in perpetuity we extract from the table the following comparisons:

No. 2. Upper route -	112,127.45	=	1,868,791
No. 4. Lowermost route	109,975.17	=	1,832,920
No. 6. Clark route -	115,898.09	=	1,931,635
No. 8. Mill route -	114,969.20	=	1,916,153
No. 10. Hall route -	117,857.93	=	1,964,299
No. 12. Intermediate route	110,137.61	=	1,835,627

And the order of preference remains unchanged, being still 4. 12. 2. 8. 6. 10.

Therefore:	*Annuity.* $		*Capital.* $
Than No. 4			
No. 12 is more costly by	162.44	=	2,707
No. 2 - by	2,152.28	=	35,871
No. 8 - by	4,994.03	=	83,233
No. 6 - by	5,922.92	=	98,715
No. 10 - by	7,882.76	=	131,379

Including now with the construction and repairs, the perpetual cost of motive power and machinery to the extent of the table, that is, of 4 engines for goods and 4 for passengers; it will be,

No. 2. Upper route -	206,995.92	=	3,449,932
No. 4. Lowermost route	207,631.16	=	3,460,521
No. 6. Clark route -	213,284.56	=	3,554,745
No. 8. Mill route -	211,707.43	=	3,528,458
No. 10. Hall route -	214,588.40	=	3,576,476
No. 12. Intermediate route	207,540.04	=	3,459,001

Here the order of preference as to cheapness has become changed so that whilst route No. 10 still remains the mostly, No. 2 has become the least so, and the order will be,

2. 12. 4. 8. 6. 10.

Consequently,	*Annuity.* $		*Capital.* $
Than No. 2			
No. 12 is more costly by	544.12	=	9,069
No. 4 - - by	635.24	=	10,589
No. 8 : - by	4,711.51	=	78,526
No. 6 - - by	6,288.64	=	104,813
No. 10 - - by	7,592.48	=	126,544

We see throughout the comparisons, including the last one, that routes No. 6, 8, and 10, or the Clark, Mill, and Hall routes, are decidedly the more costly of the six routes now under consideration; and such, obviously, are the balances against them, that no circumstances connected with the inquiry, and not herein before taken into the account and estimated, such as the compensation to proprietors of estates for damages, land and fencing, or the value to the travelling community of the difference of time required to pass the several routes, can bring either of them into advantageous competition with either No. 2, No. 4, or No. 12.

The routes No. 6, No. 8, and No. 10, are therefore *rejected:* And although of the three remaining routes No. 2, 4, and 12, No. 2 has the preference, as exhibited in the table and in the last foregoing statement, yet we shall institute more minute comparisons in relation to them.

We have shown with regard to route No. 2, that taking into view its condition as to length, summits, and curvatures, the annual cost upon it of the operation of a Locomotive Engine in the carriage of commodities to the extent herein before described, will be $10,649.80; and that to produce an equal annuity would require at 6 per cent interest a capital of $177,497; likewise of an engine with its train of coaches and passengers, an annual cost of $13,588.15, equal to the annual interest upon a principal of $226,469. And so in relation to the three routes now under consideration as follows:

	1 Locomotive with goods annual cost $	capital. $	1 Locomotive with persons annual cost. $	capital. $
No. 2. Upper route	10,649.80=	177,497	13,588.15=	226,469
No. 4 Lowermost r.	10,942.96=	182,383	13,991.87=	233,198
No. 12 Intermediate r.	10,917.60=	181,960	13,953.84=	232,564

We here see that the motive power and machinery is considerably less costly upon No. 2, and the most so upon No. 4, and this is caused by the relation of the equated distances, which with the actual distances, are as below: see table 8 or 9.

	Actual distance *Miles.*	Distance corrected for curvature. *Miles.*	Distance corrected for curvature & heights *Miles.*
No. 2. Upper route	36.8352	37.9712	48.2179
No. 4. Lowermost route	39.4742	40.4766	49.5648
No. 12. Intermediate route	39.1935	40.1952	49.5242

Now immediately before taking any account of the cost of the motive power and machinery, the comparison of the three routes stands thus:

No. 2. Upper route.

Annual charge		capital.
$		$
112,127.45	=	1,868,791

No. 12. Intermediate route.

Annual charge		capital
$		$
110,137.61	=	1,835,627

No. 4. Lowermost route.

Annual charge		capital
$		$
109,975.17	=	1.832,92

Wherein No. 4 is the least and No. 2 the most costly.

	Annuity.		Capital
No. 2, is more costly than No. 4 by	2,152.28	=	35,87
And No. 12 do - - by	162.44		2,70

So soon however, as the expenses of transit come to be inclu ded the relation of the sums to be compared begins to change and when we have added the cost of running 2 engines fo freight and two for passengers, the routes compare thus: -

Two Engines with Freight, and two with Passengers.

No. 2. Upper route.

Annual charge.		Capital.
$		$
160,603.35	=	2,676,723

No. 12. Intermediate route.

Annual charge.		Capital.
$		$
159,880.49	=	2,664,675

No. 4. Lowermost route.

Annual charge.		Capital.
$		$
159,844.83	=	2,664,082

The comparison yet continues to be against No. 2, as the mos and in favor of No. 4, as the least, costly.

	Annuity.		Capita
	$		$
No. 2, is now more costly than No. 4, by	758.52	=	12,64
And No. 12, do. - - by	35.66	=	5

Three Engines with Freight, and two with Passengers.

No. 2. Upper route.

Annual charge.		Capital
$		$
170,419.82	=	2,840,331

No. 12. Intermediate route,

Annual charge.		Capital.
$		$
169,964.76	=	2,832,746

No. 4. Lowermost route.

Annual charge.		Capit
$		$
169,954.46	=	2,832,5

No. 2. is still the most costly and No. 4, the least.

	Annuity.		Capit
	$		$
No. 2. is here more costly than No. 4. by	465.36	=	7,7
And No. 12, do. - - - by	10.30	=	1

Four Engines with Freight, and two with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
181,069.62 = 3,017,828

No. 12. Intermediate route.
Annual charge. Capital.
$ $
180,882.36 = 3,014,706

No. 4. Lowermost route.
Annual charge. Capital.
$ $
180,897.42 = 3,014,959

No. 2, yet remains to be the most costly, but No. 12, has now become the least so.

	Annuity.		Capital.
	$		$
No. 2, is more costly than No. 12, by	187.26	=	3,122
And No. 4, do. - - by	15.06	=	253

Two Engines with Freight, and Three with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
174,191.50 = 2,903,192

No. 12. Intermediate route.
Annual charge. Capital.
$ $
173,834.33 = 2,897,239

No. 4. Lowermost route.
Annual charge. Capital.
$ $
173,836.70 = 2,897,280

Here No. 2, is the most, and No. 12 the least, expensive.

	Annuity.		Capital.
	$		$
No. 2, is more costly than No. 12, by	357.17	=	5,953
And No. 4, do. - - by	2.37	=	41

Two Engines with Freight, and four with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
187,779.65 = 3,129,661

No. 12. Intermediate route.
Annual charge. Capital.
187,788.17 = 3,129,803

No. 4. Lowermost route.
Annual charge. Capital.
$ $
187,828.57 = 3,130,478

No. 4, has now become the most, and No. 2, the least, costly.

	Annuity.		Capital.
	$		$
No. 4, is more costly than No. 2, by	48.92	=	817
And No. 12, do. - - by	8.52	=	142

Three Engines with Freight, and three with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
184,007.97 = 3,066,800

No. 4. Lowermost route.
Annual charge. Capital.
$ $
183,946.33 = 3,065,774

No. 12. Intermediate route.
Annual charge. Capital.
$ $
183,918.60 = 3,065,310

Here No. 12 is the least, and No. 2, the most costly.

	Annuity.		Capital.
	$		$
No. 2, is more costly than No. 12, by	89.37	=	1,490
And No. 4, do. - - by	27.73	=	464

Four Engines with Freight, and three with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
193,407.77 = 3,223,463

No. 12. Intermediate route.
Annual charge. Capital.
$ $
193,586.20 = 3,226,437

No. 4. Lowermost route.
Annual Charge. Capital.
$ $
193,639.29 = 3,227,323

Here No. 2, is the least, and No. 4 the most costly.

	Annuity.		Capital.
	$		$
No. 4, is more costly than No. 2, by	231.52	=	3,860
And No. 12, is more costly than No. 2, by	178.43	=	2,974

Three Engines with Frieght, and four with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
197,596.12 = 3,293,269

No. 12. Intermediate route.
Annual charge. Capital.
$ $
197,872.44 = 3,297,874

No. 4. Lowermost route.
Annual charge. Capital.
$ $
197,938.20 = 3,298,972

No. 2, is the least, and No. 4, the most costly.

	Annuity.		Capital.
	$		$
No. 4, is more costly than No. 2, by	342.08	=	5,703
And No. 12, do. - - by	276.32	=	4,605

Four Engines with Freight, and four with Passengers.

No. 2. Upper route.
Annual charge. Capital.
$ $
206,995.92 = 3,449,932

No. 12. Intermediate route.
Annual charge. Capital.
$ $
207,540.04 = 3,459,001

No. 4. Lowermost route.
Annual charge. Capital.
$ $
207,631.16 = 3,460,521

No. 2, is here the least, and No. 4, the most costly.

	Annuity.	Capital.
	$	$
No. 4, is more costly than No. 2, by	635.24 =	10,589
And No. 12, is more costly than No. 2, by	544.12 =	9,069

Comparison between Routes No. 4, and 12.

	Engines with freight.		Engines with passengers.		Annuity.	Capital.
					$	$
No. 4, is *less* costly than No. 12, when there is in operation no more than	2	and	2	by	35.66 =	593
	or 3	and	2	by	10.30 =	170
No. 4, is *more* costly than No. 12, when there is in operation, as many as . -	4	and	2	by	15.06 =	253
	or 2	and	3	by	2.37 =	41
	or 2	and	4	by	40.40 =	675
	or 3	and	3	by	27.73 =	464
	or 4	and	3	by	53.09 =	886
	or 3	and	4	by	65.76 =	1.093
	or 4	and	4	by	91.12 =	1.521

It has already been asserted, as probable, that upon the opening of the railway for use, the operation of two Engines for freight, and three for passengers would be required, in which case, or in any of the six other cases in the last statement, the route No. 12, will have the advantage in cheapness or of revenue over the route No. 4. Upon considerations, therefore, based solely upon the united cost of the construction, of the repairs, and of the motive power and machinery, in relation to these two routes, No. 12 should be adopted, and No 4, *rejected.*

When however, a decision is to be made between routes so nearly equal as are these two, the difference of the combined cost of construction, repairs, and motive power and machinery, upon which does not in any case exceed $91.12 per anuum, or a capital of $1,521, and indeed in some other instances of routes differing more widely, it might not be either judicious or proper to rest the decision exclusively upon data, such as have been employed in obtaining the forgoing differences. In such cases a due regard should likewise be had to considerations of the following nature.

1. The probable amount of compensation that may be required to be paid to proprietors of estates through which the road may pass, for damages, lands and fencing.

2. The probable value to the travelling community of the difference of time to be consumed in passing from city to city upon the several routes under examination.

And 3. The relative state of the routes in a politico-economical view, or as they may affect, and be affected by, the agricultural, commercial, and manufacturing interests of the adjacent districts of country.

Now the distances to be traversed by steam power, between Baltimore and Washington upon these two routes, are as under:

	Actual distance. miles.	Distances corrected for curvature. miles.	Distance corrected for curvature and summits. miles.
No. 4. - -	39.4742	40.4766	49.5648
No. 12. -	39.1935	40.1952	49.5242
	.2807	.2814	.0406

No. 12 is then, in every respect, the shorter of the two routes, and consequently the *time*, will likewise be shorter upon it; the difference in favor of No. 12, against No. 4, in the time to be employed in passing with passengers, is, nevertheless, quite small, being less than one minute.

In respect to compensation for damages, lands, and fencing: we must remark, that in the absence of special facts indicative of the contrary, the presumption would be, that as route No. 12, is of less length by $\frac{2807}{10000}$ of a mile, or 1482 feet, the amount to be paid to the proprietors of estates upon this route will also be less.

Regarding these two routes as they may aid, or be aided by the agricultural, commercial, and manufacturing interests of the country near them, respectively; it is evident that neither route will be preferable to the other. No. 12, or the *Intermediate route*, separates from No. 4, or the *Lowermost route* at a point a short distance beyond, or southwestwardly of, the Greater Patuxent, at Dr. Duvall's; and, after crossing Snowden's ridge, unites again with the Lowermost route at Turner Belt's, near the Beaver-dams. Both occupy improved lands of Tobias and of Zadok Duvall; No. 4, finding a *pass* through Snowden's ridge to the *left*, and No. 12 to the *right*, of the Mansion-houses of both those gentlemen. The two rutes continue separate, a distance of about 3½ miles, but do not depart from each other, laterally, in any place so much as half a mile.

Viewing, then, all the facts and circumstances connected with, and bearing upon, the question of a preference between *these two routes;* we are compelled to re-affirm the *rejection* of No. 4, and the adoption of No. 12. Nor should we reverse this decision unless it shall be shown, enexpectedly, that the amount to be paid upon route No. 12 for damages, land, and fencing, will exceed that to be paid upon No. 4, by a sum greater than $1,521.

The only two routes remaining to be compared are No. 2, the *Upper route,* and No. 12, the *Intermediate* and *Lower route.*

Comparison between Routes No. 2 and 12.

	Engines with freight.		Engines with passengers.		Annuity. $		Capital. $
No. 2, is *more* costly than No. 12, when there is in operation no more than - - -	2	and	2	by	722.86	=	12,048
	or 3	and	2	by	455.06	=	7,585
	or 4	and	2	by	187.26	=	3,122
	or 2	and	3	by	357.17	=	5,953
	or 3	and	3	by	89.37	=	1,490
No. 2, is *less* costly than No. 12, when there is in operation as many as - - -	2	and	4	by	8.52	=	142
	or 4	and	3	by	178.43	=	2,974
	or 3	and	4	by	276.32	=	4,605
	or 4	and	4	by	544.12	=	9,069

The foregoing is the comparison taking into consideration the expenses of the construction of masonry, bridging, graduation, and double railway; of those of the repairs and renewals of these works in perpetuity, and of those of the motive power and machinery; the latter being extended to 4 Engines with freight, and 4 with passengers, this number being viewed as the prudential maximum of the motive power that should be admitted into these estimates. It should here be remarked that the comparison would remain the same with an equal number of trips, let the number of Engines be what they may, since the elements of comparison consist of the expenses of fuel and of wear and tear, and these are as the number of trips upon a given route. The foregoing statement would therefore be as strictly correct, and more so, perhaps, with the word *trips* substituted for that of *Engines.* It may be that one Engine with the same attendants will, occasionally, and possibly often, perform one and a half circular trips, that is, pass three times from city to city, with passengers, in the same day; and it will be practicable for an Engine to make two circular trips in a day. An advantage may, at times, accrue from such performances, and could they be kept up, of which we have doubt, the *general expenses* would consequently be lessened; at the same time, the relation of the expenditures for fuel and wear and tear upon the different routes would remain unchanged.

That two Engines at the least must be employed in the transportation of commodities upon this railway so soon as a track shall be laid down, will not, it is believed, be questioned. Hitherto, the trade between Baltimore and the city of Washington, Alexandria and Georgetown, has been comparatively limited on account of the time and expense attendant upon the conveyance. With wagons upon the turnpike road the time of passage is from two to three days, and the charge equal to 25 cents per ton per mile, or for the whole distance, 9 or 10 dollars per ton, at the least. With sloops the time *may* be a week, and the charge from $1.62½ to $5 per ton: and with steamboats the time may be from 24 to 48 hours, (the distance by water being about 200 miles) and the charge about the same as with sloops. The navigation closes in the winter season, and this is the only occasion in which the turnpike road is of any service as affording the means of the transit of commodities between the District of Columbia and Baltimore; for at other seasons of the year the effect of the great cost of freight by the turnpike road, is, as regards the transit of goods, prohibitory. The state of the case has, therefore been, and yet is, that during that part of the year in which the Potomac is navigable, the cost of freight varies from $1.62½ to $5. per ton, and during the residue of the year from $9 to $10 per ton, whilst the time of arrival is uncertain within several days or a week. Under these circumstances, however, there is between the points mentioned, a trade annually increasing in quantity and importance, and the amount received for the conveyance of commodities between Baltimore and the District, within the last year, has been at least $30,000. This amount will soon be doubled even should no new and greater facilities be afforded.

Upon the opening of the proposed railway a great reduction in the charge for the conveyance of goods, wares, and merchandize will be made, since the maximum charge for toll and transportation united will be but 4 cents, per ton a mile, according to the charter or about $1.50 per ton for the entire distance if the shorter route shall be adopted, and not exceeding $1.60 upon the longer route: added to which, there will be no interruption from the frosts of winter, but the conveyance will be speedy and uniform throughout the whole of the year. The time in making a trip with freight from city to city will be five hours, and a merchant or consignee will know, within fifteen minutes, when his goods will arrive, and the risk will be nothing. The charge for conveyance will at once be reduced from $1.62½, $5., $9. and $10 per ton, down to an uniform price, not greater in any event than $1.60, and probably, than $1.50. This alone, independently of the advantage of time and certainty, will entirely change the commercial relation heretofore subsisting, and will augment the trade perhaps beyond any amount that prudence would allow us to anticipate. It is a known general result that the use or consumption of commodities increases when the price decreases; and that the increase of use or consumption augments in a greater ratio, than the diminution in the price. Here the price of conveyance will, at once be reduced to ⅓ or ¼ of the average of former prices; consequently, the trade will be very greatly increased. Considering the price, the speed, the safety, and the certainty of the time of arrival upon the railway when compared with other lines of intercourse, there can be no doubt, but the whole of the business can be secured upon this road; and that the trade will be immediately increased to an amount that shall yield a gross charge upon the railway equal at least to what is now paid. This would give constant employment for a Locomotive Engine making a circular trip each day. The granite that shall yet be wanted in the District, and especially at the Capital of the general government, (the improvement of which has scarcely yet commenced,) in buildings, public and private, will be more than can be conveyed by one Engine in constant use. The cheapness of the conveyance by this means from the quarries on the Patapsco to Washington, and the facility of the delivery by the cars, of the stone at the yards or even at the sites of the buildings will not fail to secure this trade to the railway. The increase of the trade through Washington, in a southern direction,and likewise by the Chesapeake and Ohio Canal, as well as the enlargement of the reciprocal trade between Baltimore and the District, to result necessarily from the increase of population and wealth, will doubtless in a few years demand the action of 3, if not 4 Engines in the conveyance of commodities.

There is also to be accommodated the *local* trade that exists now to a limited extent, but which will be very greatly increased from the facilities to be afforded by the railway. At present the great cost of conveyance does not permit the transportation of lime, plaster and other stimulants to restore to its primitive fruitfulness, an exhausted soil; nor of the transportation of the rich and abundant iron ores of the Patuxent, to the vicinity of fuel, or of fuel to the region of the ores, nor of the raw materials and the manufactured articles that would otherwise be worked and fabricated by water power upon the two branches of the river Patuxent. Upon the railway, however, the manures will be carried and the lands will be improved in fertility, whilst both the cause and the effect will be the means of adding tonnage upon the railway, and so of the manufactures, and eminently so of the iron manufacture, that will doubtless be revived and extensively carried on in the districts of country immediately bordering upon the line of the railway.

The local trade that will be created by all these causes combined, added to the exchangeable products of agricultural and manufacturing capital and industry already employed between the Patapsco and the Potomac and accessible to the line of the proposed improvement, will unquestionably demand the constant work of one, and probably of two, engines: And this conclusion will appear altogether moderate upon reflecting that the local trade upon the railway between Baltimore and Ellicott's Mills, amounts to about 25,000 tons in a year, and that the water power upon the two Patuxents is abundant, constant, and easily improved; and indeed, it is already improved to some considerable extent.

Giving due weight to the foregoing considerations we must conclude that 2 and even 3 engines will be inadequate to the trade in commodities upon the Washington railway, and that the time is not very distant when 4 will be required. Whilst the facilities and advantages to be secured to the public in the conveyance of commodities, by means of the railway proposed, will be very great; yet the Company's receipts from this source will be far less in amount than what will be received for the conveyance of persons, and the net profits to remain after paying the expenses of the motive power and machinery will, at the same time, bear a much greater ratio to the gross receipts in the carriage of persons than of goods. It is from the conveyance of passengers therefore that the great and adequate sources of revenue in this concern must be derived.

The number of passengers travelling the turnpike road in regular and extra stages amounts at present to about 125 per day in both directions—and the number now passing is fully double of that which passed four years ago. In three or four years hence, therefore, and without any additional facilities, and at the same price for the passage, viz: $3,00, the number of passengers by the turnpike road will probably be increased to 200 per day. The lessening of the price to $2.50 and the reducing of the time to at least one half, will probably have the effect to increase the number 50 per cent; in that case 300 per day, or 150 in each direction would pass between the two cities. But we think it probable that from the increase of wealth and population, and business; and from increased facilities of travel to the west, the north, and the south, the number will be greater, and perhaps not less than 200 per day in each direction. Provision should therefore be made in the arrangements connected with the moving power, to accommodate this number of passengers in the commencement.

All travellers upon business or pleasure visiting the Capital of the Union from the states West, North, and East, as well as all those from the Southern states, travelling through the Seat of Government, will pass and repass upon this railway. The improved lines of communication into the interior, Westward and Northward, as well as to the Eastward parallel to the coast, now projected or in the course of construction by railways, some of which have already been completed, whilst most of them are in progress of construction, added to the increased facilities for travel afforded in steam boats, and especially between Baltimore and Philadelphia, will tend considerably to increase the number of travellers upon this line. Doubtless before many years the cities of Philadelphia and Baltimore will be connected by a continuous line of railway, as well as those of Boston, New York and Philadelphia. And this will greatly increase the travel in the winter season, hitherto prevented between Philadelphia and Baltimore unless in stages upon very bed roads and at considerable risk, and in cases of urgency and necessity only. Let communications to Washington by railways be established, and whole families will visit the seat of government during the sessions of Congress in cases where single individuals only now go there. The southern states will likewise be connected to the seat of the general government by railways, whilst the line from Baltimore to Washington will be the link connecting the railways diverging from Washington to the South and Southwest, with those diverging from Baltimore to the West, the North, and the East. And consequently the railway between Baltimore and Washington must continue to be a great central national highway upon which the quantity of travel will be very great.

It is impossible to form in advance any adequate conception of the degree of improvement in the arts and the facilities of trade and intercourse, and of the effects of these upon wealth, trade, and intercourse in a nation advancing with unprecedented vigor and enterprise, and which at the same time is comparatively of such recent origin as the United States. We can judge of the future state of the country only from the past, and by analogy; and from thence the conclusion would be highly favorable to a rapid and general advancement in every thing conducive to the comfort or constituting the strength and greatness of a people.

Should this be the happy lot of our country as we humbly hope, and believe it will be, to what amount shall we presume to limit the intercourse to and from the Capital of such a great, a wealthy, and powerful a nation; will it not be 800 or 1000 persons rather than 400 in both directions per day? We believe it will be so, at a period not very remote. We deem it therefore reasonable to calculate upon 400 in both directions or 200 in each direction daily, as the number of Passengers that must be conveyed upon the Washington railway, either immediately or very soon after it shall be open for travel—certainly by the time the second track shall be laid down. The travel between Baltimore and Frederick has been increased since the formation of the Baltimore and Ohio railroad, 6 fold. It ranged from 15 to 20 persons per day, before the railroad was opened and it is now perhaps 120 per day. The same rate of augmentation upon the route to Washington would give 750 per day, but so great an increase in so short a time ought not be expected upon the Washington railway.

Entertaining as we do, the views here expressed in relation to the probable amount of commerce and intercourse that will exist upon the contemplated railway, we deem it a duty to apply them in the comparison already instituted between the upper and lower routes, No. 2 and No. 12, and the following results are accordingly assumed as probable, viz:

That upon the opening of the first track of railway between Washington and Baltimore, 2 engines in the transit of commodities, and 3 in the conveyance of Passengers will be immediately required: each of the former to perform a circular trip daily, with a train of 10 cars laden with 30 tons of freight; and each of the latter to make a circular trip daily with a train of 6 coaches, containing an average of 67 Passengers.

In the state of the trade and travel here assumed as likely to exist immediately upon the opening of the road, the route No. 2 will be *more* costly than the route No. 12, by an annuity of $357.17, equivalent to a capital of $5,953 in present money invested at 6 per cent, per annum.

That very soon afterwards, and possibly at the opening of the road, a third Engine will be required for the conveyance of freight; in which event there will be employed 3 Engines with freight and 3 with passengers; and route No. 2, will still be *more* costly than No. 12, by an annuity of $89.37, equivalent to a capital of $1,490.

That by the time the second track shall be completed the number of Engines employed may be 4 for freight and 3 for passengers, and this will change the relation of things so that, No. 2, will be *less* costly than No. 12, by an annuity of $178.43, aquivalent to a capital of $2,974.

That ultimately, and possibly within the course of a few years after the double railway shall be completed, 4 Engines for freight and 4 for passengers will be in operation. In that case No. 2, will be *less* costly than No. 12, by an annuity of $544.12 equivalent to a Capital of $9,069.

No. 2 will also be very slightly the least expensive with the operation of 2 Engines for freight, and 4 for passengers, the difference being only $8.52 per annum, and the same route will be the least expensive of the two, when 3 Engines for freight and 4 for passengers shall be employed, by an annuity of $276.32 equivalent to a Capital of $4,605. If the same number of trips shall be made with fewer Engines, the comparative expensiveness of the two routes will remain unaltered.

Upon the whole therefore, we conclude that route No. 2 will, in the end, be rather the most economical, regarding upon both the cost of construction, repairs and renewals, and motive power and machinery:

We apprehend that if route No. 12 shall be adopted instead of No. 2, the consequent gain for the first two years after the first track shall be opened, there being in use 2 Engines for freight and 3 for passengers, will be,

$

Two years operations at a gain of $357.17 per ann. = 714.34

And that the gain in the next subsequent three years, with 3 Engines for freight and 3 for passengers, will be;

Three years operations at a gain of $89.37 per ann. = 268.11

Difference of gain to accrue in the first 5 years in consequence of adopting route No. 12 instead of route No. 2. - - - - } = $982.45

Probably about the end of these two short terms there will be required 4 Engines for freight and 3 for passengers, and these may be sufficient for a further period of 5 years, during which time there will be a relative loss in consequence of adopting route No. 12 of

Five years operations at a loss of $178.43 per ann. = 892.15

Difference of gain to accrue in the first 10 years in consequence of preferring route No. 12 to route No. 2. - - - - } $90.30

After the termination of this period there may probably be required 4 Engines with freight and 4 with Passengers, in which event, the loss in the next subsequent year, will be,

One years operations at a loss of - - $544.12

Balance against route No. 12 at the close of the first eleven years operations, - - } = $453.82

After which the loss is estimated at $544.12 per annum in perpetuity.

The result of the foregoing investigations, therefore is, that route No. 12 will be the most economical for the first 10 years: but that route No. 2 will be the most so ever after the close of that term, and that the difference in favor of No. 2 subsequently to that period, and perhaps for a second term of 10 years, might be $544.12 per annum. What the state of the case beyond the period last mentioned may be, we shall not pretend to conjecture, further, than that it will not be less favorable to route No. 2.

We see then that our calculations when followed out to their consequences, result rather against the *Lower* and in favor of the

Upper route. The difference is however of small amount in such a concern; and granting that in 20 years it may exceed $544.12 per annum, or that the gain in favor of the upper route may ultimately be the double of this sum, yet as the expense upon this route will work a comparative loss in the first 10 years, we should not, probably, under any supposed circumstances, estimate the actual difference in favor of the upper route at more than $544.12 per annum, or a capital of $9,069.

It must be borne in mind that the foregoing estimates regard the probably *cost* of transit, and therefore have no necessary connection with, or dependence upon, the charges that the company are permitted in the charter to make for the toll and transportation of persons and goods. And that the absolute cost, as well as the relative cost regarding the different routes, will be the same whatever the charge for the carriage of a ton or the conveyance of a person may be. If, however, the charges upon the several routes could be different so as to bear a constant ratio to the annual expenses, then the net profits would be the same upon each respective route, whilst the *public* must pay more on one route than they would have paid upon another; provided always, (and which is in violation of acknowledged principles in political economy) the public would use the more costly route to the extent they would the cheaper one. With the regard to the conveyance of passengers, the subject is clear of all complication upon the matter of charge, the charter having fixed it at so much per person for the entire distance, and consequently the gross amount received from a passenger will be the same upon the longer as upon the shorter route, or upon the more costly as upon the cheaper route. It is evident therefore, that the net income from passengers will be the greatest upon a route where the cost of their conveyance will be the least. The income from this, the greater source of profit, will consequently be something more upon the *upper* than upon the *lower* route. This, at least, is the conclusion from the premises hitherto considered in relation to these two routes, and to which there remains yet to be applied the three additional subjects of consideration enunciated and considered in the comparison of routes No. 4 and No. 12.

With regard to the carriage of commodities, some might come to a conclusion different from that which we have just drawn with respect to passengers, inasmuch as, for freight, the charge is fixed in the charter at so much per ton per mile: and consequently may be greater in amount upon a longer route than upon a shorter one. The lower route being 2⅓ miles longer than the upper route, and the maximum charge being 4 cents per ton per mile, it follows, that the charge upon the entire distance by the former will be greater than upon the entire distance by the latter, 9⅓ cents per ton: and as a part of this equal to about 1½ cents will be absorbed in the greater expenses of carriage upon this route, there would appear to remain a balance of 7⅚ cents per ton in favor of the lower route. But, as the two routes stand related, this would be a tax upon trade to that extent, and it might lessen the tonnage to an amount more than commensurate with the difference in the charge. Considering that a rivalry will exist by water and by land for the carriage of commodities, and that a rivalry will also take place between the proprietors of the granite quarries of the Patapsco and those owning similar quarries to the eastward, we apprehend it would not be discreet to build upon any apparent balance of revenue to flow from a change upon an increase of the distance, as just mentioned, believing as we do that these circumstances may not permit of the charge per ton for the entire distance to be greater upon the lower than upon the upper route, viz: $1.52 at the most.

It remains to compare the probable cost of damages, land and fencing; time consumed in passing the entire distance with passengers; and the advantages in relation to agriculture, commerce, and manufactures, of the upper and lower routes: The distances for the action of steam, being as follows:

	Actual distance	Distance corrected for curvature	Distance corrected for curvature & summits
	Miles.	*Miles.*	*Miles.*
No. 2. Upper route	36.8352	37.9712	48.2179
No. 2. Lower route	39.1935	40.1952	49.5242
Differences in favor of the upper route =	2.3583	2.2240	1.3063

We know not to what extent relinquishments of damages for right of *way* and fencing have been made to the company upon either of the routes, as the returns from the Agents have not yet been received; at least we are not apprised of them. Should the releases cover no greater distance upon one route than upon the other, the difference in length of the routes would still remain subject to the charges mentioned, the amount of which is uncertain. The damages for the division of lands and their occupancy by the road, together with fencing, might, for the difference of distance, amount to the sum of $2,358.30. This, however, could depend upon the opinion of the parties in case of a compromise, or of jurors in case of legal determinations. As the releases when received may be found to prevail more upon one route than upon the other, we cannot rely upon any comparison instituted solely on the difference of distance: and here we rest for the present this branch of the subject.

Time employed in the passage.

It has been stated that the load for the Locomotive Engine weighing 6½ tons, with 4 tons bearing upon the rails through the two adhesion wheels, the adhesion being $\frac{1}{8}$, on the ascending parts of the Washington railway, would be $50\frac{3}{4}$ tons, and that the supply of steam would be competent to a speed of 15 miles per hour.

Adding the weight of Engine and tender, $11\frac{1}{2}$ tons, the total gross tonnage is $62\frac{1}{4}$ tons; and the same power would maintain a speed of 20 miles per hour with $\frac{62\frac{1}{4} \times 15}{20} = 46\frac{1}{2}$ tons gross, or of 35 tons exclusive of Engine and tender, that is, with 12 coaches and their complement of passengers. However, to assure the certainty of the trip within the desired time in the winter season, with the rails more slippery than usual, and the adhesion reduced to perhaps $\frac{1}{12}$, the calculation will be as follows: lb.

Power of adhesion = $\frac{1}{12}$ of 4 tons = $\frac{8960}{12}$ = 747

Less of power from curvature and gravity of Engine and tender - - - - - - 105

Effective power of traction = - - 642

And $\frac{642}{20}$ = 32 tons, the weight of the train, when the speed is 15 miles per hour: adding for the Engine and tender, the total gross weight of the train is $43\frac{1}{2}$ tons, therefore $\frac{43\frac{1}{2} \times 15}{20} = 32\frac{1}{2}$ tons at 20 miles per hour, or, exclusive of Engine and tender 21 tons, being rather more than equal to 7 coaches with passengers. Consequently the trains of 6 coaches and 67 passengers which we have assigned as the load can at all seasons be propelled at a speed of 20 miles per hour up the ascending parts of the railway, allowing at the same time for a contingent power sufficient, as is believed, to counteract the retarding effect of the centrifugal force in curves: The least radius of curvature in the greatest ascent being 3016 feet.

If therefore, the speed be 20 miles per hour upon the actual distance, the upper route will be traversed in $\frac{36.8352}{20} = 1.84176$ hours, or 1 hour $50\frac{1}{2}$ minutes; and the trip with steam would then be made in *two hours*, allowing, at the same time, $9\frac{1}{2}$ minutes for stopping or unavoidable detention at the half-way station to replenish with water, and for a few brief pauses elsewhere, one of which, to the extent of a minute of time must always take place at the intersection of the two railways.

In this manner the trip would be made in the short period of two hours with a velocity of 20 miles an hour. But it must be observed, that although this velocity can probably be maintained, with safety, in a curve of 1000 feet radius, the centrifugal force being 60 lb. per ton, since curves of 400 feet radius have frequently been passed upon the Baltimore and Ohio railway with that velocity, the centrifugal force being then 150 lb. per ton,[*] yet we shall not recommend so high a velocity upon the parts of the *way* curved with a radius less than 1000 feet. Now there are parts of the Baltimore and Ohio railway to be traversed on the route to Washington, of less radius than this, and we shall assume 2 miles, or about one third of the distance to be used upon that road as being of a description upon which the velocity should not be allowed to exceed 15 miles per hour: It will then require, in order to secure an average speed of 20 miles the hour, that about 5 miles of the railway, where it shall be straight, must be run at the rate of 24 miles per hour; and allowing the same rate of speed upon each, the two routes would then be traversed as follows:

The Upper Route.

	Miles.					Minutes
	2.0000	at 4 min. to the mile,	or 15	miles per hour	=	8
	5.0000	at 2½ min. do.	or 24	do.	=	12½
	29.8352	at 3 min. do.	or 20	do	=	89½
Total	36.8352					110
				Add for delays	=	10
		Total time consumed 2 hours			= minutes	120

The Lower Route.

	Miles.					Minutes.
	2.0000	at 4 min. to the mile,	or 15	miles per hour	=	8
	5.0000	at 2½ min. do.	or 24	do.	=	12½
	32.1935	at 3 min. do.	or 20	do	=	96½
Total	39.1935					117
				Add for delays	=	10
		Total time consumed 2 hours 7 min.			= minutes	127

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[*] In page 72 of the 4th Annual Report of the Baltimore and Ohio Rail Road Company, there is a theorem given by me for calculating the centrifugal force in curves, as follows:

viz: $f = \frac{11wv2}{240r}$, or $f = \frac{22}{15} \times \frac{wv2}{32r}$, wherein

$f =$ the centrifugal force in pounds.

$w =$ the weight in pounds, of the moving body.

$v =$ the velocity in miles per hour.

$r =$ the radius in feet, of the curve.

Now this theorem was rendered erroneous in not multiplying twice instead of once by the factor $\frac{22}{15}$, of the velocity. Having recently discovered the error it is thought right to correct it. The theorem should have been $f = (\frac{22}{15})^2 \times \frac{wv2}{32r}$, or $f = \frac{121wv2}{1800r}$. And this in a curve of 400 feet radius and velocity 10 miles per hour gives 37½ lb. per ton as the centrifugal force instead of 25 lb. as there given.

We believe that the foregoing rates of speed can be safely maintained, with the use of proper machinery upon the contemplated railway, and that the journey will be made, ultimately, if not immediately, within the time specified, *two hours*, especially if the upper route shall be adopted. As the time consumed must, however, be such as shall generally be approved by the travelling community it follows, that whatever may be our confidence upon this head, the experience of the future alone can determine the time with certainty.

Keeping within the same limits of speed as appear to govern in the operations upon the railway across the peninsula between Frenchtown and Newcastle, the trip to Washington would be made in about 2½ hours. The speed upon that road appears to be well and safely maintained at 16 miles an hour; and making a corresponding reduction upon 2 miles of the Baltimore and Ohio rail road the most curved, the two routes, as to time, will then compare as below:

The Upper Route.

	Miles.		Minutes.
	2.0000	at 5 min. to the mile, or 12 miles per hour =	10
	34 8353	at 3¾ min. do. or 16 do. =	130½
Total	36.8353		140½
		Add for delays =	10
		Total time consumed 2 hours 30½ min. = minutes	150½

The Lower Route.

	Miles.		Minutes.
	2.0000	at 5 min. to the mile, or 12 miles per hour =	10
	37.1935	at 3¾ min. do. or 16 do. =	139½
Total	39,1935		149½
		Add for delays =	10
		Total time consumed 2 hours 39½ min. = minutes	159½

We see therefore, that if the journey is performed in about 2 hours, more time by 7 minutes would be required upon the lower than upon the upper route, and that when the time employed is about 2½ hours, the difference against the lower route will be 9 minutes. It is true that if we regarded alone the forces to be employed, the difference would be less, perhaps not over 4½ minutes. But as the running *amain* down the descents of a railway will not do, either in point of economy, as respects the machinery, or of safety as regards the passengers, so we cannot count upon a higher velocity upon the descending than upon the level parts of the road: And it will be still safer, as guarding more against the fracture of wheels, axles, or of other mishaps, to keep the motion uniform throughout as well upon the ascending grades as upon those that shall be level or descending. It will be practicable in a great degree to accomplish this end with the loads that we have assigned, and upon grades and curvatures such as have been established upon the Washington railway.

The difference of time in favor of the upper route will probably therefore, be 7 minutes, equal to 6 per cent. of the whole time to be employed in making a trip.

What this difference in the time may be worth to the passengers cannot be accurately estimated. That it will have an equivalent money value we have no doubt; but the essential difficulty in the way of assigning it lies in the variableness and consequent uncertainty that there is in the data. Every passenger will doubtless attach a value to his time; one *more*, another *less*; and it would seem moderate to assign a dollar as the average value, to each person, of a day of 8 hours; and for 400 persons, the number that will probably very soon pass upon the road (that is, 200 in each direction), this would be $400 per day of 8 hours, or $50 for an hour, and for 7 minutes $5.83⅓. The value of the difference in the time upon the two routes, according to this mode of estimation, would therefore be $5.83⅓ per day, and per annum $2,129.17, equivalent, in present money, to a capital of $35,486.

This estimate of the worth of time in the comparison, depends upon opinion rather than upon fixed data, and is therefore conjectural, and must be weighed accordingly. Whatever opinion may be formed, however, of the value of a difference of only 7 minutes of time in a journey of about 2 hours duration; still, it must be conceded that in a contested case such as would arise in an *opposition*, and this is the light in which we view the different routes in comparing them, the difference, small as it may appear, might be sensibly felt in its effects.

It remains to consider the two routes as they may respectively advance the agricultural, commercial, and manufacturing interests of the adjacent districts of country between the Potomac and Patapsco; or as the revenues of the road may be affected by those interests. And we must observe, that the sum of the advantages possessed by one route over the other, is not so obviously marked as to produce the conviction of a very decided preference in these respects.

The Lower route will have the advantage as regards the interests of agriculture on account of its nearer approach to the fertile soil of the county of Prince George, whilst the Upper route will in a higher degree subserve the interests of manufactures by its greater proximity to the water power of the Patuxents. It is true that the Lower route passes a mill and a forge upon one branch of the Patuxent, and a mill upon the other branch; but the Upper route passes in the vicinity of the Savage Factory, an extensive establishment upon one branch of the river, and of a factory upon the other branch, whilst the far greater part of the fall and water power of those streams are in the vicinity and above, or to the right of, the Upper route. The Upper route will pass nearer to Montgomery, but whether that county will be much benefitted in consequence, may be doubtful. Anne Arundel will be nearly equally well accommodated in its agricultural interests by either route. Whether the revenue upon the railway will be greater upon the Lower route from the agricultural commerce of Prince George that would not pass upon the road if made on the Upper route, than it would be upon the Upper route from the manufacturing commerce of the Patuxents that would not pass upon the road it made upon the Lower route, is a question of some complexity, and the right determination of it would depend upon the extent to which the water power afforded by those two streams in their passage through the granite formation, will be applied to manufacturing purposes.

Comparison in relation to Toll.

It is considered as not altogether irrelevant in this place, to state that if both railways shall be compensated for the *use* in proportion to the length of each; or, which is the same, if the Baltimore and Ohio Rail Road company shall, exclusive of its dividends as a stockholder, be allowed to receive, as will be just and right, a compensation as toll for the use of so much of the Baltimore and Ohio Rail Road as shall be traversed on the route to Washington, and if this division or allotment of toll shall be made in proportion to the distances upon each road, then if the Upper route is adopted, the length of which from the depot, near the basin in Baltimore, to New Jersey Avenue, in Washington, is 37.7769 miles; that is, 7,9300 miles upon the Baltimore and Ohio Rail Road, and 29,8469 upon the branch; it will be:

For every sum of $100,000 to be divided as toll.

Upper Route.

	$
The Washington railway will be entitled to -	79,008

	$
And the Baltimore and Ohio railway to - -	20,992
	100,000

Lower Route.

The length 40.1352 miles, viz: 7.9300 miles on the Baltimore and Ohio Rail Road, and 32.2025 miles on the branch.

The Washington railway will be entitled to -	80,242
And the Baltimore and Ohio railway to - -	19,758
	100,000

And so in proportion for lesser or greater sums.

Recapitulation of the principal features upon, and connected with, the Upper and Lower Routes, No. 2, and No. 12.

The maximum grade upon the Washington branch, and upon both routes, is 1 in 264 or 20 feet to the mile, and the same on the part to be used by steam power of the Baltimore and Ohio Rail Road in the journey to and from Washington.

The minimum radius of curvature on the Washington branch is 1273 feet, and is common to both routes. This is the radius in two instances of not exceeding half a mile in length each, and upon a horizontal grade. In one instance common to both routes the radius is 2000 feet for about half a mile, and in another upon the Upper route 2388 feet for about a mile, in neither of which is the grade so much as 1 in 264. The least radius upon this grade is 3016 feet and common to both routes. The radii upon the residue are mostly 5730 feet and more.

The total height, averaged in both directions of the summits upon the branch, by the Upper route, is 182 $\frac{614}{1000}$ feet, and by the Lower route, 164 $\frac{259}{1000}$ feet; and inclusive of that portion of the Baltimore and Ohio Rail Road, to be passed with steam power, to and from Washington, the height of the summits is 204 $\frac{934}{1000}$ feet, upon the Upper route and 186 $\frac{579}{1000}$ feet by the Lower route. Difference in favor of the latter 18 $\frac{355}{1000}$ feet. The highest summit above the level of mid-tide upon the railway by the Lower route will be 160 feet, at Merill's ridge, and upon the Upper route 172 feet, at Snowden's ridge.

Upon the Upper route there will be of masonry 48,874 perches at an average of $6.21½ per perch, and of the graduation 2,073,637 cubic yards of earth to excavate and remove at an average of 34 $\frac{88}{100}$ cents per yard. Upon the Lower route, the masonry will be 46,753 perches at $6.42½ per perch, and 2,038,385 cubic yards of earth to excavate and remove at 32 $\frac{22}{100}$ cents per yard.

Of the Distances.

	Upper Route. Miles.	Lower Route. Miles.	Difference. Miles.
Actual distance on the B. & O. Rail Road within Baltimore city, and for horse power, -	0.9417	0.9417	0.0000
Actual distance on the B. & O. R. Road thence to intersection of branch to Washington,	6.9883	6.9883	0.0000
Actual distance on the B. & O. Rail Road from depot at Charles and Camden sts. to said intersection, - - -	7.9300	7.9300	0.0000
Actual distance on the Branch thence to New Jersey Avenue, in the city of Washington,	29.8469	32.2052	2.3583 U*
Of which there will be, of straight railway, - -	16.1380	18.8604	2.7224 U
And of curved railway,	13.7089	13.3448	0.3641 L
Actual distance from Balt. to Washington, to be traversed with steam, - - -	36.8352	39.1935	2.3583 U
The latter corrected for curvature, - - - - -	37.9712	40.1952	2.2240 U
The same corrected for curvature and summits, - -	48.2179	49.5242	1.3063 U
Between Balt. and Washington, there will be, of railway actually straight, - -	20.5586	23.2810	2.7224 U
And of curved railway,	16.2766	15.9125	0.3641 L
Total actual distance from depot at Charles and Camden streets, in Baltimore to New Jersey Avenue, in Washington.	37.7769	40.1352	2.3583 U

Estimated cost of Construction.

Miles. Miles.

By upper route, length 29.8469, and by lower route, length 32.2052

	U. route. $	*L. route.* $	*Difference.* $
Masonry and bridging, *plus* 10 per centum, -	303,746	300,389	3,357 L

---

* U signifies that the difference at which it is placed is in favor of the Upper route, and L that it is favor of the Lower route.

	U. Route.	*L. Route.*	*Difference.*
	$	$	$
Graduation, *plus* 10 per cent,	723,370	656,698	66,672 L
Grad. masonry and bridging,	1,027,116	957,087	70,029 L
Railway, double track,	432,780	466,975	34,195 U
Graduation, masonry, bridging and Railway, -	1,459,896	1,424,062	35,834 L

Estimate for repairs and renewals.

Extraordinary repairs of graduation in first 5 years with 10 per cent.	56,310	55,341	969 L
Ordinary repairs of graduation and masonry, per annum	$9,216\frac{33}{100}$	$8,491\frac{35}{100}$	$724\frac{98}{100}$ L
Repairs and renewals of double railway, *average* per annum	$11,938\frac{76}{100}$	$12,882\frac{8}{100}$	$943\frac{32}{100}$ U
Total of the annual repairs and renewals, in perpetuity per annum	$21,155\frac{9}{100}$	$21,373\frac{43}{100}$	$218\frac{34}{100}$ U
The same augmented by the annual interest of *extraordinary repairs* in first 5 years considered as Capital will be, per annum	$24,533\frac{69}{100}$	$24,693\frac{89}{100}$	$160\frac{20}{100}$ U

But if the cost of restoring the embankments from the effects of settling, and improving the slopes of the excavations, needful in the first 5 years and denominated extraordinary repairs, be considered as Capital, and we incline to think it should be so considered: Then,

The total cost of construction is estimated to be	1,516,206	1,479,403	36,803 L
And the repairs and renewals at, per annum	$21,155\frac{9}{100}$	$21,373\frac{43}{100}$	$218\frac{34}{100}$ U

Estimate of the cost of the Motive power and Machinery.

	$
Prime cost of a burthen car, weight $1\frac{1}{4}$ tons to carry 3 tons of freight, on springs, $148.80, or say	150
Do of a passenger coach, weight 2600 lb. and to carry 16 to 20 persons	700
Do of a Locomotive Engine, weight $6\frac{1}{2}$ tons	4,000
Do of a Tender and tank, weight, with fuel and water, 5 tons	360

The Engine with Tender attached will proceed in the transit of commodities from 8 to 10 miles per hour, so as to make a trip from city to city in 5 hours, and a circular trip in a day; (which has been assumed in the course of the calculations in round numbers at 80 miles, but the excess of this above the true distance need not be noticed:) it would convey in this manner a train of 12 cars of a gross weight of $50\frac{3}{4}$ tons, of which 36 tons would be freight, with the adhesive power of two wheels having 4 tons upon them, the rate of adhesion being $\frac{1}{8}$ and the resistance from friction curvature and gravity, united, being 20 lb. per ton. About one third part of the cars in motion, however, it is supposed may be empty owing to the inequality or fluctuation of trade, and accordingly the Engine is allowed to convey, besides empty cars, a train of only 10 cars, laden with 30 tons of freight. It is further supposed that for every laden car thus in motion there will be 4 cars stationary at depots, shops, &c. denominated spare cars, or 40 of such cars for each train of 10 laden cars in motion, but to come into action in turn. It is further assumed that in order to ensure the constant action of one Engine, 2 spare Engines and tenders will be required in addition, and so of a greater number. That the Engine must make a circular trip daily for 312 days in the year, and the estimate is made on the machinery in motion, adding the interest for what is called spare machinery, with an allowance for salary of Superintendent of transportation and Clerks, and for expenses at depots, water stations, &c. and denominated *general expenses.*

Cars. The wear and tear of a burthen car in constant use and running 80 miles per day, is estimated at \$116.28 per annum, equal to $37\frac{1}{2}$ cents per day, or $\frac{1}{2}$ a cent a mile. This includes \$8.93 interest on the prime cost of the car, \$9.76 for wear and tear of empty cars, and \$6.24 for oil, the latter being 2 cents per day, or $\frac{1}{40}$ of a cent per mile per car, or, when the burthen is 3 tons, only $\frac{1}{120}$ of a cent per ton of freight per mile. To the foregoing must be added \$35.72 the interest on 4 spare cars, making the total cost of a freighted car in use \$152. per annum, or 49 cents per day, equal to $\frac{5}{8}$ of a cent per mile, and per ton of freight, a little over $\frac{1}{5}$ of a cent a mile.

Tender and tank. The wear and tear and interest of one Tender and tank is estimated at \$182.51 per annum, or $58\frac{1}{2}$ cents per day, equal to $\frac{3}{4}$ of a cent a mile, travelling with freight.

Locomotive Engine. The wear and tear and interest of a Locomotive Engine in constant use travelling as before described, is estimated at \$1643.09 per annum, or \$5.27 cents per day, and therefore, of both the Engine and Tender, at \$1825.60 per annum, or \$5.85 per day, being $7\frac{314}{1000}$ cents per mile.

Adding \$3 per day for Engineer and assistant, \$10.50 for $1\frac{1}{2}$ tons anthracite coal, and \$1.67 interest per day on 2 extra En-

TABLE 1.

An exhibit of the twelve Routes, with letters referring to the Maps, showing the distances upon each, with the quantities and estimated probable cost of Graduation, the quantities and estimated probable cost of Masonry and Bridging, the estimated probable cost of a double Railway; and the total amount of the estimates for Graduation, Masonry and Railway, upon each Route, with the cost per mile, commencing on the Baltimore and Ohio Rail Road, at the end of six miles from the first Depot, on Pratt Street, and ending at New-Jersey Avenue, in the City of Washington.

No	Description of Route, with the letters as on the Maps.	Distances	Total mass of earth and rock to be removed and supplied	Cost per cubic Yard.	Cost of Graduation.	Total mass of Masonry	Cost per Perch.	Cost of Masonry.	Cost of Graduation and Masonry	Entire cost of Graduation and Masonry, with 10 per cent added.	Cost per Mile of Graduation and Masonry	Cost of Railway double track, at $14,500 pr. mile	Total cost of Graduation, Masonry and Railway	Total cost per Mile.
		Ms Dec	Cubic Yds	Cents	$ Cts	Perches	$ Cts	$	$ Cts	$ Cts	$	$ Cts	$ Cts	$
1	Upper Route by Smith's Bridge A B C D E F G H I K L M N O P Q R S T U.	31.2021	2 174 412	31 29/100	680 641.76	39 594	6.47	255 023 [a]	935 664.76	1 029 231.24	34 078	457 930.45	1 487 161.69	48 578
2	Upper Route by Hockley Mill A X Y D E F G H I K L M N O P Q R S T U V	30.8352 29.8469	2 047 637	31 71/100	657 109.12	48 874	5.64	276 133	933 242.12	1 027 116.33	34 413	432 780.05 [b]	1 459 896.38	48 913
3	Lowermost Route by Smith's Bridge A B C D E F G a b c d e f g h i k l m P Q R S T U V	32.8411	2 140 452	28 74/100	615 495.76	37 096	6.77	251 397	866 892.76	953 582.04	29 036	476 195.95	1 429 777.99	43 536
4	Lowermost Route by Hockley Mill A X Y D E F G a b c d e f g h i k l m P Q R S T U V	33.1742 32.1859	2 039 677	29 4/100	592 463.11	46 574	5.85	272 507	864 970.11	951 467.12	29 288	471 045.55	1 422 512.67	43 788
5	Clark Route, by Smith's Bridge A B C D E F G a b c d e s t u r s k l m P Q R S T U V	32.7254	2 378 719	29 7/100	691 456.72	38 056	6.73	256 210	947 655.72	1 042 421.29	31 853	474 518.30	1 516 939.59	46 353
6	Clark Route by Hockley Mill A X Y D E F G a b c d e o t u r s k l m P Q R S T U V	33.3585 32.3702	2 277 974	29 35/100	668 404.08	47 546	5.83	277 320	945 733.08	1 040 306.39	32 138	469 367.90	1 509 674.29	46 638
7	Mill Route by Smith's Bridge A B C D E F G a b c d e o p q r s k l m P Q R S T U V	32.2799	2 321 392	29 44/100	686 081.47	37 916	6.49	256 138	942 219.47	1 036 441.42	32 108	468 058.55	1 504 499.97	46 608
8	Mill Route by Hockley Mill. A X Y D E F G a b c d e o p q r s k l m P Q R S T U V	32.9131 31.9248	2 231 617	29 44/100	663 048.83	47 390	5.83	277 248	940 296.83	1 034 326.51	32 399	462 909.60	1 497 236.11	46 899
9	Hall Route by Smith's Bridge A B C D E F G a b c d e o t v r s k l m P Q R S T U V	32.2782	2 442 056	29 33/100	720 865.91	38 150 37 318	6.77	252 887	973 752.91	1 071 128.20	33 186	468 053.90	1 539 182.10	47 686
10	Hall Route by Hockley Mill. A X Y D E F G a b c d e o t v r s k l m P Q R S T U V	32.9114 31.9231	2 341 981	29 43/100	697 833.27	46 788	5.85	273 997	971 830.27	1 069 013.30	33 487	462 884.95	1 531 898.25	47 987
11	Intermediate Route by Smith's Bridge A B C D E F G a b c d e f g o q r s k l m P Q R S T U V	32.5604	2 139 160	28 88/100	620 030.82	37 276	6.76	251 971	872 001.82	959 202.00	29 459	472 125.80	1 431 327.80	43 959
12	Intermediate Route by Hockley Mill A X Y D E F G a b c d e f g o q r s k l m P Q R S T U V	33.1935 32.2052	2 038 385	29 28/100	596 998.18	46 753	5.84	273 081	870 079.18	957 087.10	29 718	466 975.40	1 424 062.50	44 218

a The cost of Masonry on Routes Nos. 1 and 2, as here stated, is augmented by $13,380, for three wooden structures, to wit, viz. $6000 for a Bridge, to pass the Annapolis Road over the Rail Road at Merrill's Ridge; a like sum to pass the Turnpike over the Rail Road at Snowden's Ridge, and $1,380 for a wooden superstructure at Point Branch, where the level is too low for stone arches. The cost upon each of the other routes is increased by $8,028, being $6,000 for a Bridge for the Annapolis Road at Merrill's Ridge, and $2,028 for Point Branch, being necessary to provide additional vent there for the water upon those routes.

b The several routes by Hockley Mill, pass on the Baltimore and Ohio Railway a distance of 5218 feet = 0.9883 miles, therefore, in calculating the cost of the Railway, as well as the cost per mile of the Graduation and Masonry on routes No. 2, 4, 6, 8, 10, 12. This distance of .9883 miles, is deducted from the respective distances for these Routes, as they stand first in the Table, and the results being the actual lengths of new Road, are set down under the numbers that give the total distance from the point of intersection of the route by Smith's Bridge with the Baltimore and Ohio Rail Road, to New-Jersey Avenue, in Washington City.

TABLE 9. OF THE CONVEYANCE OF PASSENGERS.

Exhibiting the actual and equated distances by Railway, as proposed, from the first Depot on Pratt Street, in the City of Baltimore, and 66 above the level of mid-tide, to New-Jersey Avenue, in the City of Washington, at a point 40 feet above tide. Likewise the daily cost of a train consisting of one Locomotive Engine and tender, and six Coaches containing 67 Passengers, travelling 20 miles an hour, and performing one circular trip each day, of twice the distance between the two cities and detailing the probable cost of fuel, wear and tear, spare Engines, Tenders and Coaches, together with interest and other expenses; and the cost for the year of 365 days of the constant working of 1, 2, 3 and 4, such trains; with the capital in present money, equivalent to these expenses, in perpetuity, reckoning interest at 6 per cent. per annum: the whole being calculated for the 12 different routes.

No	Actual distance from 1st Depot, Baltimore, to N. J. Avenue, Washington	Distance corrected for curvature	Distance corrected for curvature and grade	Daily expenses per train, or expenses each trip, circular.				Annual expense of motive power in the conveyance of Passengers, for the year of 365 days				Capital equivalent to the annual cost of motive power, as just stated			
				Fuel, Anthracite Coal.	Wear & tear of Engine & Coaches	Attendants, meters & general expenses	Total per day or per trip	1 train.	2 trains.	3 trains	4 trains.	1 train.	2 trains	3 trains	4 trains
	Miles	Miles	Miles	$	$	$	$	$	$	$	$	$	$	$	$
1	36.2021	37.1618	48.0345	8.7500	12.7709	15.4000	36.9209	13 475.80	26 951.60	40 427.40	53 903.20	224 597	449 194	673 791	898 388
2	36.8352	37.9717	48.2197	8.7797	13.0481	15.4000	37.2278	13 588.15	27 176.30	40 764.45	54 352.60	226 469	452 938	679 407	905 876
3	38.8411	39.4467	49.4014	8.9951	13.6509	15.4000	38.0260	13 879.49	27 758.98	41 638.47	55 517.96	231 325	462 650	693 975	925 300
4	39.4742	40.4766	49.5018	9.0210	13.9090	15.4000	38.3339	13 991.87	27 983.74	41 975.61	55 967.48	233 198	466 396	699 594	932 792
5	38.7254	39.6671	48.9011	8.9041	13.6309	15.4000	37.9350	13 846.28	27 692.56	41 538.84	55 385.12	230 771	461 542	692 313	923 084
6	39.3585	40.1765	49.0645	8.9338	13.9090	15.4000	38.2128	13 958.62	27 917.24	41 875.86	55 834.48	232 644	465 288	697 932	930 576
7	38.2799	39.1347	48.4799	8.8273	13.4348	15.4000	37.6823	13 754.04	27 508.08	41 262.12	55 016.16	229 234	458 468	687 702	916 936
8	38.9131	39.9642	48.6434	8.8572	13.7330	15.4000	37.9901	13 866.42	27 732.84	41 599.26	55 465.68	231 107	462 214	693 321	924 428
9	38.2782	39.2377	48.3387	8.8018	13.4832	15.4000	37.6850	13 755.03	27 510.06	41 265.09	55 020.12	229 251	458 502	687 753	917 004
10	38.9114	40.0172	48.5022	8.8315	13.7114	15.4000	37.9929	13 867.41	27 734.82	41 602.23	55 469.64	231 124	462 248	693 372	924 496
11	38.5604	39.3858	49.3618	8.9878	13.5340	15.4000	37.9218	13 841.16	27 682.32	41 523.48	55 364.64	230 691	461 382	692 073	922 764
12	39.1935	40.1952	49.5242	9.0173	13.8123	15.4000	38.2296	13 953.54	27 907.08	41 860.62	55 814.16	232 564	465 128	697 692	930 256

TABLE 2.

Extraordinary Repairs of Graduation.

No of Route.	Length of New Road.	Total mass of earth removed in construction	1-10 of the mass extra. repairs, 1st 6 years.	Cost at 25 cents per cubic yard	Total cost, adding 10 per cent.	Cost of extra repairs per mile
	Miles	Cubic yds.	Cub. yds	$	$	$
1	30.2021	2 174 412	217 441	54 360	59 796	1980
2	29.8469	2 047 637	204 764	51 191	56 310	1887
3	32.8411	2 140 452	214 045	53 511	58 862	1792
4	32.4859	2 113 677	211 368	52 842	58 126	1705
5	32.7254	2 378 749	237 875	59 469	65 416	1999
6	32.3702	2 251 974	225 197	56 299	61 929	1913
7	32.2799	2 321 392	232 139	58 035	63 839	1978
8	31.9248	2 194 617	219 462	54 865	60 352	1890
9	32.2782	2 442 056	244 206	61 052	67 157	2081
10	31.9231	2 315 281	231 528	57 882	63 670	1995
11	32.5604	2 139 160	213 916	53 479	58 827	1807
12	32.2052	2 012 385	201 238	50 310	55 341	1718

TABLE 3.

Ordinary Repairs of the Graduation and Masonry.

No. of Route	Length of new Road.	Ordinary repairs of Graduation.	Ordinary repairs of Masonry	Superintendence	Ordinary repairs of Graduation per mile.	Ordinary repairs of Masonry per mile	Superintendence per mile	Total per mile	Total cost of ordinary repairs per annum	Equivalent capital per mile	Total equivalent capital.
	Miles.	$ Cts	$ Cts	$	$ Cts	$ Cts	$ Cts	$ Cts	$ Cts	$	$
1	30.2021	6497.66	1402.44	1500	218.45	46.44	49.67	314.56	9400.10	5243	156 668
2	29.8469	6197.66	1518.75	1500	207.65	50.88	50.25	308.78	9216.35	5146	153 606
3	32.8411	5608.68	1382.69	1500	170.79	42.10	45.68	258.57	8491.37	4310	141 523
4	32.1859	5318.68	1498.79	1500	165.42	46.13	46.17	255.72	8317.47	4262	138 458
5	32.7254	5928.52	1409.21	1500	181.16	43.06	45.84	270.06	8837.73	4501	147 296
6	32.3702	5628.52	1525.31	1500	173.88	47.12	46.34	267.34	8653.83	4456	144 231
7	32.2799	6019.13	1408.76	1500	186.47	43.64	46.47	276.58	8927.89	4610	148 798
8	31.9248	5719.13	1524.87	1500	179.15	47.76	46.99	273.89	8744.00	4565	145 733
9	32.2782	6647.56	1390.88	1500	205.95	43.09	46.47	295.51	9538.44	4925	158 974
10	31.9231	6347.56	1506.99	1500	198.84	47.21	46.99	293.04	9354.55	4884	155 909
11	32.5604	5789.40	1385.84	1500	177.81	42.56	46.07	266.44	8675.24	4441	144 587
12	32.2052	5489.40	1501.95	1500	170.45	46.64	46.58	263.67	8491.35	4395	141 523

TABLE 4.

Exhibiting the results of Estimates of the probable cost of construction of each single Track, and of the Repairs and Renewals, together with the Interest, at 6 per cent. per annum, and the Equivalent Capital in present money, involved in each mile of double Railway, upon ten different methods of construction.

No	Cost per mile of two concrete tracks, in present money	Double track, cost per mile for construction in present money.	Interest per mile of double track, per annum.	Repairs and renewals per mile of double track per annum	Annual charge for repairs, renewals, and interest.	Capital equivalent to the annual repairs & renewals per mile in perpetuity	Capital equivalent to construction, repairs and renewals per mile of double track	REMARKS.
	$	$	$ Cts.	$ Cts	$ Cts	$	$	
1	7 477 6 435	13 912	834.72	482.34	1 317.06	8 039	21 951	Method of Construction. Longitudinal oak sills supporting transverse white oak sleepers, upon which rest yellow pine string pieces, [illegible] inches square, supporting, continuously, the iron edge rail, rolled with a flat base, weighing 25 lb. per yard each [illegible] per mile of track.
2	8 953 7 123	16 076	964.56	387.38	1 351.94	6 456	22 532	Longitudinal sills 6 inches square, supporting sleepers [illegible] inches square, and string pieces [illegible] inches square—all of sawed Southern yellow pine. Iron rail as before, [illegible] lb. per yard [illegible] per mile of track.
3	7 138 7 138	14 276	856.56	387.38	1 243.94	6 456	20 732	Method of construction, identical with No. 2, except only that this is supposed to be preceded by a track of more temporary construction, as in No. 5. The difference of cost between No. 3 and 2, being that hauling the materials by railway and by the turnpike road.
4	8 026 8 026	16 052	963.12	340.64	1 303.76	5 678	21 730	The same form of construction, in all respects, as in No. 2 and 3, except that stone blocks are substituted for the yellow pine longitudinal sills, so that the sleepers shall bear upon the stone. This method is also to be preceded by the temporary track as in No. 5.
5	5 880 5 388	11 268	676.08	652.20	1 328.28	10 870	22 138	Iron rails the same as before, 25 lb. per yard [illegible] tons per mile of track, to be laid on timber found in the vicinity of the route of the road, on [illegible]. The track to be laid on hewn longitudinal oak sills resting upon white oak sleepers, 4 feet apart, and to be styled temporary.
6	7 786 6 946	14 732	883.92	427.74	1 311.66	7 129	21 861	No string pieces used here. Heavier Iron rails, same form, weighing at least 50 lb. per yard [illegible] tons per mile of track, are laid immediately upon the sleepers, the latter being of white oak, and supported by longitudinal sills of oak.
7	8 243 8 243	16 486	989.16	286.72	1 275.88	4 779	21 265	Sawed sleepers laid on longitudinal sills of yellow pine, 6 inches square, but no string pieces, the heavy rails of 50 lb. per yard [illegible] tons per mile of track, being laid immediately upon the sleepers. This construction to be preceded by a temporary track laid as in No. 5.
8	8 432 8 432	16 864	1 011.84	322.36	1 334.20	5 373	22 237	Iron rails 25 lb. per yard [illegible] tons per mile of track, to be laid on hewn string pieces 6 inches square, on yellow pine sleepers, [illegible] inches square, resting upon yellow pine longitudinal sills, 6 inches square, and to be preceded by the temporary track, laid as in No. 5.
9	10 375 10 375	20 750	1 245.00	135.54	1 380.54	2 259	23 009	Stone blocks and Iron [illegible] rails weighing [illegible] lb. per yard = [illegible] tons per mile of track to be preceded by the temporary track of No. 5.
10	5 886 5 593 2 921	14 403 or say 14 500	870.00	400.00	1 270.00	6 667	21 167	Temporary track, as in No. 5, first laid. In [illegible] years, a second track precisely as in No. 3, and in [illegible] years more, a third track as in No. 2 [illegible] the temporary track, and the [illegible] be reduced [illegible] lb. per yard [illegible]

[TABLE 5.]

GRADES OF UPPER ROUTE.

Station of commencement.	Station of termination.	ASCENT per		DESCENT per		Height of commencement of grade.	Length of each grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
		100 Feet.	Mile.	100 Feet.	Mile.					Miles Ft.
No. 1 of A.	2	Level	"	"	"	66.430	0. 100	"	No. 1 is opposite the 6th Mile stone of the Baltimore and Ohio Rail Road, and from it the total distances are counted.	0. 000
2	58	"	"	0.320	16.896	66.130	1. 260	312½		0. 100
58	71	Level	"	"	"	48.510	0.1500	"		1. 360
71	381	0.380	20,064	"	"	48.510	5.4589	264		1.1869
381	497	Level	"	"	"	166.270	2.1040	'	1st Division commences at the 6th Mile stone, and ends at 364.	7.1169
497	535	"	"	0.380	20.064	166.270	0.3800	264		9.2209
535	558	Level	"	"	"	151.830	0.2300	"		10. 729
558	570	0.380	20,064	"	"	151.830	0.1200	264	2d Division ends at 888.	10.3029
570	572	Level	"	"	"	156.390	0. 200	"	3d do. " 1314.	10.4229
572	600	0.380	20,064	"	"	156.390	0.2800	264	4th do. " 1543.	10.4429
600	616	Level	"	"	"	167.030	0.1600	"	City Division, " 1603.	11.1949
616	661	"	"	0.380	20.064	167.030	0.4500	264		11.3549
661	690	Level	"	"	"	149.930	0.2831	"		12.2769
690	748	0.380	20,064	"	"	149.930	1. 520	264		13. 323
748 of O,1	825 of D	Level	"	"	"	171.970	1.1620	"		14. 843
825 of D.	1102	"	"	0.380	20.064	171.970	5.1300	264		15.2463
1102	1111	Level	"	"	"	66.710	0. 951	"		20.3763
1111	1147	"	"	0.380	20.064	66.710	0.3600	264		20.4717
1147	1273	Level	"	"	"	53.030	2.2010	"		21.3037
1273	1303	"	"	0.350	18.480	53.030	0.3000	285.9		23.5077
1303	1314	Level	"	"	'	42.530	0.1100	"		24.2797
1314	1334	"	"	0.380	20.064	42.530	0.2023	264		24.3897
1334	1349	Level	"	"	"	34.843	0.1500	"		25. 640
1349	1434	0.380	20,064	"	"	34.843	1.3220	264		25.2140
1434	1503	Level	"	"	"	67.143	1.1547	"		27. 80
1503	1574.52	"	"	0.380	20.064	67.143	1.1872	264		28.1627
1574.52	1603	Level	"	"	"	39.962	*.2848	"	*This level terminates at New-Jersey Avenue, beyond which point the grades and calculations have not been continued	29.3499
										30.1067

NOTE.—At the City Boundary, at No. 1543, the altitude of the Road is 51,943 feet above mid tide; the difference between which altitude, and that of the terminating level across the Tiber, must be deducted from the above table of ascents, to show the total ascent from the City Boundary to the 6th Mile-post. The difference spoken of is 11,981 feet.

GRADES OF THE LOWER ROUTE.

Station of Commencement from 50 feet back.	Station of termination.	ASCENT per		DESCENT per		Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
		100 Feet.	Mile.	100 Feet.	Miles.		Ms. Ft.			
of 365	400	"	Level	"	"	160.000	0.3550	"		6.4799
400	501	"	"	0.350	18.480	160.000	1.4850	285.9		7.3069
501 of E	690 of P	"	Level	"	"	124.545	1.1892	"		9.2639
690 of P	638 of P	"	"	0.380	20.064	124.545	.5200	264	2d Division on lower Route begins at 364 of A, and ends at 395 of P.	13.4631
638	587	"	Level	"	"	104.785	.5100	"		14.4551
587	519	0.300	15.840	"	"	104.785	1.1500	333	3d Division ends 1314 of upper Route	15.4371
519	472	Level	"	"	"	125.125	0.4700	"		17. 591
472	395	"	"	0.380	20.064	125.125	1.2420	264		18. 11
395	376	Level	"	"	"	95.865	.1900	"		19.2131
376	375	"	"	0.250	13.200	95.865	. 100	400		19.4331
375	352	"	"	0.380	20.064	95.610	.2300	264		19.4431
352	265	"	"	0.160	8.448	86.875	1.3420	625		20.1451
265	233	"	Level	"	"	72.955	.3200	"		21.4871
233	211	"	"	0.380	20.064	72.955	.2200	264		22.2791
211	151	"	"	0.210	11.088	61.595	1. 720	476.2		22.4991
151	15.6	Level	"	"	"	52.000	2.3031	"		24. 431
15.6	1303 of T or upper route.	"	"	0.350	18.480	52.000	.2706	285.9		26.3165
1303	1314	Level	"	"	"	42.530	.1100	"		27. 891
										27.1991

The upper and lower Routes separate at Stn. 364, on Merrill's Ridge, the beginning of the 2d Division, and unite again at 1314, the end of the 3d Division, at the Washington Turnpike, near Bladensburgh.

Grades of the System of Collateral Surveys between No. 399 vnd 766 of P line or Lowermost Route.

Grades upon lines S and L or Clark Route.

Station of Commencement.	Station of Termination.	ASCENT per		DESCENT per		Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
		100 Feet.	Mile.	100 Feet.	Mile.					
No. 1 of S or 766 P	No. 2 of L North,	Level	"	"	"	124.545	3.3102	"		13.2311
No. 2 of L North,	No. 1 of L North or Sth	0.075	3.960	"	"	124.545	0. 100	1333		16. 133
No. 1, of L South,	No. 28 of L South,	0.380	20.064	"	"	124.620	0.2700	264		16. 233
28	74	"	Level	"	"	134.880	0.4600	"		16.2933
74	75	"	"	0.050	2.640	134.880	0. 100	2000	M. Ft. Total distance at 467 of P, counting on lowermost route - - 18.511	17.2253
75	105 of L= 467 of P,	"	"	0.380	20.064	134.830	0.3049	"	P line or - - - - 18.122	17.2353
									Difference, = 389	18. 122

The junction at 467 P, is abrupt without an interposing curve.

Grades upon Q and N Lines, from 73 of L South.

Station of Commencement.	Station of Termination.	ASCENT per 100 Feet.	ASCENT per Mile.	DESCENT per 100 Feet.	DESCENT per Mile.	Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
73 of L or 1 of Q,	12 of Q	"	Level	"	"	134.880	.1100	"		17.2153
12 of Q,	13	"	"	.278	14.678	134.880	. 100	360	M. Feet. Total distance at 374.76 of P line, counting on it - - 19.4455	17.3253
13 of Q,	374.76 of P	"	"	.380	20.064	134.602	2. 490	264	19.3844	17.3353
									Difference in favor of Q and N 611	19.3844

Grades of O and N Lines or Mill Route.

Station of Commencement.	Station of Termination.	ASCENT per 100 Feet.	ASCENT per Mile.	DESCENT per 100 Feet.	DESCENT per Mile.	Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
71 of O North or 38 of S,	22 of O North	"	Level	"	"	124.545	.4900	"		13. 731
22	21	"	"	0.305	15.860	124.545	. 100	327.8		14. 351
21	4	"	"	0.380	20.064	124.240	.1700	264		14. 451
4 North	39 South	Level	"	"	"	117.780	.4100	"		14.2151
39	56	.380	20.064	"	"	117.780	.1700	264		15. 971
56	57	.305	15.860	"	"	124.245	. 100	327.8		15.2671
57	97	"	Level	"	"	124.545	.4000	"		15.2771
97	98	.075	3.960	"	"	124.545	. 100	1333		16.1491
98	112	.380	20.064	"	"	124.620	.1400	264	M. Feet.	16.1591
112	473 of N line	"	Level	"	"	129.940	.4517	"	Total distance at 374.76 of P counting on P, - - 19.4455	16.2949
473 of N,	374.76 of P	"	"	.380	20.064	129.940	1.4544	264	Counting on O and N, - 19.1492	17.2228
									Difference in favor of O & N, 2 963	19.1492

Grades of M Line East and West, or Hall Route.

Station of Commencement.	Station of Termination.	ASCENT per 100 Feet.	ASCENT per Mile.	DESCENT per 100 Feet.	DESCENT per Mile.	Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
No. 114 of M Et.	65	"	Level	"	"	124.545	0.4823	"		14.1893
66	65	0.075	3.960	"	"	124.545	. 100	1333		15.1436
65	45	0.380	20.064	"	"	124.620	.2000	264		15.1536
45 M East	31 M West	"	Level	"	"	132.220	1.2120	"	M. Feet.	15.3536
31	33	"	"	.087	4.593	132.220	. 100	1150	Total distance at 453 of P counting on P - - - 18.1911	17. 376
32	69 or 453 of P	"	"	.380	20.064	132.133	.3743	264	Counting on M E and W - 17.4219	17. 476
									Difference in favor of M E & W .2972	17.4219

Grades of R Line, connecting O and P or Mill Route, and Lowermost Route.

Station of Commencement.	Station of Termination.	ASCENT per 100 Feet.	ASCENT per Mile.	DESCENT per 100 Feet.	DESCENT per Mile.	Height of commencement of Grade.	Length of each Grade in Miles and Feet.	Rates of Grade 1 in.	REMARKS.	Total distance.
57 of R or 606 of P	51 of R		Level	"	"	104.785	. 582	"	M. Ft.	15.2471
51	50	.075	3.960	"	"	104.785	100	1333	Total distance at 95 of O counting on O, - - - 16.1221	15.3053
50	1 of R or 95 of O	.380	20.064	"	"	104.860	.4900	264	Counting on P and R - 16.2773	15.3153
									Difference in favor of O = 1482	16.2773

gines and tenders, the cost of a Locomotive in constant use in the transit of commodities, running 8 miles an hour for 10 hours in the day, is estimated at $21.02 per day equal to $26\frac{275}{1000}$ cents per mile.

General expenses. These are assumed at $10,000 per annum for salaries of Superintendent of transportation and Clerks, and expenses connected with depots, water stations, &c. of which one half, or $5,000 is charged to the transit of commodities. Then, when only 2 Engines are in operation, each must be charged with $2,500 per annum, or $8. per day on account of these general expenses; when, however, more than 2 Engines in the transit of commodities shall operate, the daily charge of this item per Engine, will be lessened in proportion.

Cost of carriage. When 2 Engines only are in constant use, the expense per ton of goods per mile will be:

	Of a cent.
For the expense of cars - - - -	.203
For Locomotive Engine expenses - -	.876
For general expenses $8. for the carriage of 2400 tons 1 mile	.333
	1.412

Being $1\frac{412}{1000}$ of a cent per ton of goods per mile, and which cannot under any reasonable management exceed 1½ cents, and will probably be reduced to 1¼ cents, and possibly to 1 cent.

Expenses per train. The daily expenses per train will be as under:

	$
Daily expenses of a Locomotive Engine -	21.02
Do of train of 10 cars at 49 cents, or more exactly $48\frac{72}{100}$ cents, each	4.87
Do general expenses - - -	8.00
	$33.89

Taking the day's travel at 80 miles with 30 tons of freight, it is equal to 2,400 tons 1 mile for 3389 cents or 1.412 cents per ton per mile, as before.

Expenses upon the different routes. The same train will still make a circular trip each day, whichever route may be adopted, but in consequence of varience in distance, curvature, and summits, the expenses of the motive power and machinery will vary on the different routes.

The consumption of fuel will be as the power, or as the distance corrected for curvatures and summits, whilst the wear and tear will be proportional to the distance increased for curvature only. The interest on extra machinery, pay of Engineer and assistant for the management of the Engine, and general expenses for depots, salaries, water stations, &c. will be the same on any route now under comparison. And the analysis of $33.89 the daily expenses per train, per circular trip with freight will be:

1. The expenses proportional to the actual distance corrected for curvatures and summits, viz.		$
Fuel,		10.50
2. The expenses proportional to the actual distance corrected for curvatures, viz:		
Wear and tear of Locomotive Engine and tender,	$5.85	
Wear and tear of 10 laden cars,	3.72	
		9.57
3. Expenses that will be the same on any of the routes viz:		
Engineer and assistant; and interest on 2 extra Engines and tenders,	$4.67	
Interest on 40 extra cars for each train of 10 laden cars =	1.15	
General daily expenses for salaries, dedopts, &c.	8.00	
		13.82
Total cost of each train, as before =		$33.89

Now assuming these to be the daily expenses per train upon some one of the routes, as No. 1, for instance, then the daily and yearly expenses per train with commodities, upon routes No. 2, and No. 12, will be as follows:

Expenses upon Route No. 2, the Upper Route.

	per day $	per annum. $
Fuel,	10.5359	3,287.10
Wear and tear,	9.7784	3,050.86
General expenses, interest and attendants,	13.8200	4,311.84
	34.1343	10,649.80

Expenses upon Route No. 12, the Lower Route.

	per day $	per annum. $
Fuel,	10.8213	3,376.25
Wear and tear,	10.3510	3,229.51

Attendants, interest and general expenses, - - -	13.8200	4,311.84
	34.9923	10,917.60

Hence the annual expenses per train, making a circular trip daily with freight is greater upon the *Lower* than upon the *Upper* route, by $267.80.

The foregoing is the expense *per train*, when only two Engines for freight are in operation. When three Engines shall operate, (or which is the same as to the comparative expense upon the routes, when three circular trips shall be made in a day with freight) then the general expenses of depots, salaries, &c., will be further divided, and the expense per train on the Upper route will be $9,816.47 per annum, and upon the Lower route $10,084.27. Moreover, when four Engines shall be in operation, the expenses upon the Upper route will be $9,399.80 per annum, and upon the Lower route $9,667.60. Still the motive power and machinery will be more costly upon the *Lower* than upon the *Upper* route when two Engines are in operation, by $535.60 per annum, when three Engines are in operation, by $803.40, and when four Engines shall be in constant use, by $1,071.20 per annum.

Conveyance of Passengers. The gross weight of a coach containing 16 to 18 or 20 persons is about 2¾ tons, and consequently the Locomotive Engine contemplated (or such a one as is the Atlantic, now on the Baltimore and Ohio Rail Road,) would travel the proposed railway with a train of 18 such coaches containing 300 persons; at least in the summer season. The supply of steam, however, would probably not be sufficient to maintain a speed over 12 or at most 15 miles per hour, whilst in motion, with such a train; and this will not be a sufficiently high velocity upon the Washington railway: besides, this number of passengers would seldom offer at one time. It is not improbable, however, that ultimately, 100 passengers may be a usual number in a train. The train would then consist of eight coaches, viz: six for the passengers and two for baggage, &c.

Coaches. The expense of wear and tear, &c. of a Coach has been estimated at $364.47 per annum, or $1. per day of 365 days in the year, equal to about 1¼ cents per mile, allowing a circular trip per day. This includes $84. per annum as the interest of two extra coaches for each one in use, as well as $42 for the interest on the coach in use.

Engine and tender. The repairs and renewals for wear and tear, and Interest, of one Locomotive Engine and Tender in use, running 80 miles every day at a speed of 20 miles an hour, are estimated to cost $2975.91 per annum of 365 days, or $8.15 per day, equal to 10⅕ cents ger mile.

Other expenses. One half of $10,000 will be added to the expenses of two Engines, making $6.85 per day per Engine in use, for salaries, depots, water stations, &c. And as these expenses may increase, we have taxed the same expense to each Engine when a greater number is estimated for. $1.50 per day is now estimated for the assistant, and there is added $2 per day for a Conductor.

Daily expenses. The daily expenses of a Locomotive Engine and train of Coaches with 100 passengers, making each day a circular trip between Baltimore and Washington, will be, viz:

	$
Engineer, wages, - - - -	2.00
Assistant, do. - - - - - -	1.50
$1\frac{1}{2}$ tons anthracite coal, at $7. - - -	10.50
Wear and tear of Engine and tender, - -	8.15
Interest per day on 2 extra Engines and tenders,	1.67
Total for Engine and tender, = - -	$23.82
Eight Coaches at $1 per day = - - -	8.00
Conductor, wages, - - - - - -	2.00
General expenses, - - - - -	6.85
Total per day, =	$40.67

This expenditure is for conveying 100 passengers, say 80 miles, and is $40\frac{2}{3}$ cents per person, or for the single trip between the two Cities, it is at the rate of $20\frac{1}{3}$ cents per person, or a fraction over half a cent a mile per passenger. Adding for conveyance into the city from the Engine station, the expenses of conveyance from city to city will be about 24 cents per passenger.

Two Engines employed as above would convey between the two cities 400 passengers, or 200 in each direction, daily. It is deemed probable however, that the public convenience, will require a greater number of trips than will be made with two Engines, even for the same number of passengers; that more times for starting will be necessary, especially in connection with the conveyance of the mails; and moreover, though no doubt is entertained of the ability of the Engine to perform the trip even in *two hours* with the above train in the summer season, and when the adhesion will be $\frac{1}{8}$, yet, in the winter season the adhesion of the propelling wheels will be reduced to $\frac{1}{12}$, in which case, and allowing for the retarding effect of the centrifugal force in curves, 6 coaches will probably be a sufficient load for the Engine at a speed of 20 miles the hour. Therefore, to guard against disappointments, to ensure regularity and success, and to enlarge the public convenience; it is finally supposed, that the usual trains may, in practice, be 6 coaches, with an average of, say, 67 passengers; and still allowing 1 or 2 coaches of the number to be partly filled with persons, or entirely filled with baggage. Then the estimate of the daily expense will be, viz:

Engineer, wages,	$2.00
Assistant, do.	1.50
1¼ tons Anthracite Coal, at $7,	8.75
Wear & tear of Engine & tender,	8.15
Interest on 2 spare Enginas & tenders per Engine in use,	1.67
Total for Engine and tender, =	$22.07
6 Coaches, at $1	6.00
Conductor, Wages,	2.00
General expenses,	6.85
Total per day, =	$36.92

Here we have 67 persons conveyed the circular trip for 3692 cents, being 55 cents each, equal to 27½ cents from city to city. The same coaches are supposed to enter the city of Baltimore with horse-power, which will probably increase the expense of the trip to 31 cents, per person or about ¾ of a cent per mile.

The foregoing expenses have been analysed and apportioned upon the different routes as was done in relation to the expenses of a train with commodities, and the results are as follows:

Expenses upon route No. 2, the Upper Route.

	per day. $	per annum. $
Fuel	8.7797	3,204.59
Wear and tear	13.0481	4,762.56
Attendants, Interest, and general expenses	15.4000	5,621.00
	37.2278	13,588.15

Expenses upon route No. 12, the Lower route.

	per day. $	per annum. $
Fuel	9.0174	3,291.35
Wear and tear	13,8123	5,041.49
Attendants, Interest, and general expenses	15.4000	5,621.00
	58.2297	13,953.84

And the annual expenses per train making a circular trip daily with passengers is greater upon the *lower* than upon the *upper* route by - - - - - $365.69.

And of two Engines and trains		by - -	731.38
And of 3	do	by - -	1097.07
And of 4	do	by - -	1462.76

Now it has been shown that the balance in favor of the Lower route at the close of the construction of the masonry and bridging, graduation, and a double railway, will probably be $35,834, the annual interest of which is $2,150.04. The extraordinary repairs of the graduation also result in favor of the Lower route by $969, the annual interest of which is $58.14. But the ordinary repairs of masonry and graduation and repairs and renewals of the double railway, will be the least on the Upper route by $218.34 per annum. Therefore considering the annual Interest of all the coustruction with all the annual repairs of the masonry, bridging, graduation and railway, the balance against the Upper route will probably be $1,989.84 per annum. But it has been seen that the motion power and machinery will be the most expensive on the Lower route; and most favorable upon the Upper route; and we can now give the statements to show how the relative expensiveness of the two routes will be effected, when the motive power and machinery shall be taken into the account with the operation of the number of Engines or trips as below.

Engines or trips with freight. Engines or trips with passengers.	Difference of motive power and machinery in favor of U. route per annum. $	Difference in construction of masonry, graduation and railway (double track) and of extraordinary & ordinary repairs and renewals in favor of lower route, per annum $	Final difference $
With 2 and 2	1266.98 U	1989.84 L	722,86 L
3 and 2	1534.78 U	1989.84 L	455 06 L
4 and 2	1802.58 U	1989.84 L	187.26 L
2 and 3	1632.67 U	1989.84 L	357.17 L
3 and 3	1900.47 U	1989.84 L	89.37 L
2 snd 4	1998.36 U	1989.84 L	8.52 U
4 and 3	2168.27 U	1989.84 L	178.43 U
3 and 4	2266.16 U	1989.84 L	276.32 U
4 and 4	2533.96 U	1989.84 L	544.12 U

Whilst therefore, there is in use only 2 and 2, 3 and 2, 4 and 2, 2 and 3, or 3 and 3 Engines with freight and passengers, respectively, or whilst the same number of trips with freight and passengers shall be made, the final balance will be in favor of the *Lower route.* But on the other hand, when there shall be as many as 2 and 4, 4 and 3, 3 and 4, or 4 and 4 Engines, or trips, with freight and passengers, respectively, the final balance will then be in favor of the *Upper route.* And the probability seems to be that the balance will continue in favor of the Lower route during the first 10 years after the first track shall be opened for trade and travel; but that, after this period owing to the increase of trade and travel, the final balance will probably be in favor of the Upper route, not however, exceeding in the whole, $544.12 per annum.

From all which it would appear that with regard to the expenses connected with the construction of the Rail Road in all its parts, and of the repairs and renewals of the same, as well as of the motive power and machinery to be employed upon it, the two routes stand nearly equally poised, but with a small balance prospectively in favor of the Upper route.

The *time* to be employed in passing from city to city will be less by the upper than by the lower route.

At a speed of 15 miles per hour for 2 miles of the more curved portions of the Baltimore and Ohio Rail Road to be passed, of 24 miles per hour for 5 miles of the straight parts of the branch, and of 20 miles per hour for the residue of the entire distance, and allowing 10 minutes for delays on the way, the upper route will be traversed in exactly 2 *hours.* And the lower route under the same circumstances of speed, in 2 hours and 7 minutes.

All this will be practicable, and probably safe, nevertheless, should a speed not exceeding 16 miles per hour be prefered; then if the before mentioned 2 miles be traversed at 12 miles an hour, and the residue of the entire distance at 16 miles per hour, the journey will be performed by way of the upper route in 2 hours 30½ minutes, and by way of the lower route in 2 hours 39½ minutest exclusive of 10 minutes for delays, in each case.

Respectively submitted,

J. KNIGHT,
Chief Eng'r. Balt. and O. R. Road Co.

PHILIP E. THOMAS,
President, &c.
July 27th, 1833.

[E.]

Fourth Annual Report of the Superintendent of Graduation and Masonry of the Baltimore and Ohio Rail Road.

Office of the Supdt. of Graduation and Masonry
of the Baltimore and Ohio Rail Road.

Baltimore, 1st. Oct. 1833.

To the President of the Baltimore
and Ohio Rail Road Company.

Sir:—The graduation and masonry of the Baltimore and Ohio Rail Road having, at the period of my last annual report, been completed as far as it could, under the then existing circumstances be extended, my attention was, by your instructions, directed to a general revision and examination of the whole work, and subsequently to the superintendence of the repairs of the entire line.

The general condition of the road was found to be in a state of good preservation, and the masonry, though on several parts of the line exceedingly heavy, remained every where substantial and unimpaired. Indeed I am able to assure you that there has yet been discovered no sufficient cause to apprehend any danger of the solidity and permanency of this very important portion of the work.

My attention, during the early part of the summer, by your instructions, withdrawn from the repairs of the road and directed to the location of that part of the line intermediate to the Point of Rocks and Harpers' Ferry, which was not under construction by agreement with the Chesapeake and Ohio Canal Company, I proceeded to the execution of that duty, under the direction of the Chief Engineer, and having accomplished the object, the maps and profiles of the line were duly reported to that officer, and after a personal examination of the route, were approved by him.

Before the completion of this service the superintendence of the graduation and masonry of the Lateral Rail Road to Washington city devolved upon me, and since the completion, of the location, has occupied my undivided attention. In pursuance of advertisements inserted in the several papers of the cities of Baltimore, Frederick and Washington, proposals were presented on the 20th of June, for the erection of a stone structure across the Patapsco river on the 1st section of the 1st division of the road, and also for the graduation of that section. The proposals were submitted, together with a report respecting

TABLE 6.

Of the Curvatures upon the several Routes located for the lateral Road to Washington, beginning at the 6th Mile Post on the Baltimore and Ohio Rail Road, and ending at New Jersey Avenue, in the City of Washington.

No.		Straight line	15'	20'	23'	26'	30'	34'	40'	46'	48'	50'	51'	52'	54'	55'	1° 00'	1° 04'	1° 05'	1° 08'	1° 10'	1° 11'	1° 15'	1° 18'	1° 20'	1° 25'	1° 30'	1° 34'	1° 40'	1° 45'	1° 48'	1° 50'	1° 54'	2° 00'	2° 24'	2° 30'	4° 00'	4° 30'	5° 00'	5° 30'	6° 00'	8° 15'	10° 00'	11° 00'	Correction for curvature in ft.
	Length of Radii in feet.	T.	22920	17190	14947	13223	11460	9828	8595	7480	7162	6878	6741	6612	6367	6251	5730	5405	5305	5056	4914	4844	4584	4408	4298	4047	3920	3659	3438	3274	3183	3126	3016	2865	2387	2292	1432	1273	1146	1042	955	694	573	521	
1	Upper Route by Smith's Bridge,	870.99		38.23			68.00	4.34	10.00	22.00	8.00	34.80				6.00	87.27		19.00		31.00	34.00	9.00			17.00	143.00		10.00	7.25		15.00	68.00		20.64	49.00									3238
2	Upper Route by Hockley Mill,	897.27		38.23			23.00	4.34	10.00	22.00	8.00	34.80				6.00	121.27	21.40	19.00		31.00	34.00	9.00			17.00	129.00		10.00	7.25		15.00	59.00	1.00	20.64	49.00	20.00	22.65	5.00	7.00	0.50	1.00	2.00	3.40	4169
3	Lowermost Route by Smith's Bridge,	1035.35	37.00	9.23			202.12		10.00			8.00	13.00		2.00		132.27	44.40			14.00						109.00	6.00	10.00	7.25			73.00		20.64										2533
4	Lowermost Route by Hockley Mill,	1061.63	37.00	9.23			157.12		10.00			8.00	13.00		2.00		166.27	23.00			14.00						95.00	6.00	10 00	7.25			64.00	1.00	20.64		20.00	22.65	5.00	7.00	0.50	1.00	2.00	3.40	3464
5	Clark Route by Smith's Bridge,	946.52	37.00	9.23			190.12		10.00			8.00		13.00			74.27	21.40		39.42							250.00	6.00	10.00	7.25			86.00		20.64										3143
6	Clark Route by Hockley Mill,	970.80	37.00	9.23			145.12		10.00			8.00		13.00			108.27			39.42							236.00	6.00	10.00	7.25			77.00	1.00	20.64		20.00	22.65	5.00	7.00	0.50	1.00	2.00	3.40	4074
7	Mill Route by Smith's Bridge,	989.14	37.00	9.23			186.18		10.00			16.00					91.27	21.40			35.00			7.58	19.00		134.00	6.00	10.00	7.25	31.00		73.00		20.64										2790
8	Mill Route by Hockley Mill,	1015.42	37.00	9.23			141.12		10.00			16.00					125.27				35.00			7.58	19.00		120.00	6.00	10.00	7.25	31.00		64.00	1.00	20.64		20.00	22.65	5.00	7.00	0.50	1.00	5.00	3.40	3721
9	Hall Route by Smith's Bridge,	911.55	37.00	9.23	13.43		186.12		10.00		15.23	13.00			2.00		102.27	21.40		8.42							214.00	6.00	10.00	7.25			73.00		63.64										3237
10	Hall Route by Hockley Mill,	936.83	37.00	9.23	13.43		141.12		10.00		15.23	13.00			2.00		136.27			8.42							200.00	6.00	10.00	7.25			64.00	1.00	63.64		20.00	22.65	5.00	7.00	0.50	1.00	2.00	3.40	4168
11	Intermediate Route by Smith's Bridge,	1014.96	37.00	9.23		13.00	232.12		10.00			8.00					128.27	21.40						7.58			89.00	6.00	10.00	7.25	31.00		73.00		20.64										2529
12	Intermediate Route by Hockley Mill,	1041.01	37.00	9.23		13.00	187.12		10.00			8.00					162.27							7.58			75.00	6.00	10.00	7.25	31.00		64.00	1.00	20.64		20.00	22.65	5.00	7.00	0.50	1.00	2.00	3.40	3460

NOTE.—The Routes No. 2, 4, 6, 8, 10, 12, pass on the Baltimore and Ohio Rail Road, from the point of intersection at the 6th mile post, a distance, towards the Hockley Mill, of 5218 feet, and the curvatures having the radii 955,694,573; and 521 feet are upon this part of the Baltimore and Ohio Rail Road. The curves of 1042 and 1046 feet radius upon the route of the proposed new Road, are near the Patapsco, and will, upon a revision of the line, be brought to a radius of 1273 feet.

TABLE 7.

Exhibiting the actual distances, heights overcome, in each direction, and the average in both directions, together with the equations, or corrections, for altitude and for curvature, and the distances corrected for altitudes and curvatures upon the 12 routes surveyed for the lateral Rail Road, from the 6th mile post on the Baltimore and Ohio Rail Road, to New-Jersey Avenue, in the City of Washington.

No.	Actual measured distance.	Heights from Washington to B. and Ohio Rail Road	Heights from Baltimore & Ohio Rail Road to Washington.	Average Heights for both directions.	Equation for average Heights.	Equation for Curvature.	Distance corrected for curvature.	Distance corrected for Heights and Curvature.
	Miles.	Feet.	Feet.	Feet.	Miles.	Miles.	Miles.	Miles.
1	30.2021	213.768	187.300	200.534	10. 267	.6133	30.8154	40.8421
2	30.8352	200.848	174.380	187.614	9.3807	.7896	31.6248	41.0055
3	32.8411	190.598	164.130	177.364	8.8682	.4797	33.3208	42.1890
4	33.4742	177.678	151.210	164.444	8.2222	.6560	34.1302	42.3524
5	32.7254	180.593	154.125	167.359	8.3680	.5953	33.3207	41.6887
6	33.3585	167.673	141.205	154.439	7.7220	.7716	34.1301	41.8521
7	32.2799	182.418	155.950	169.184	8.4592	.5284	32.8083	41.2675
8	32.9131	169.498	143.030	156.264	7.8132	.7047	33.6178	41.4310
9	32.2782	177.933	151.465	164.699	8.2350	.6131	32.8913	41.1263
10	32.9114	165.013	138.545	151.779	7.5890	.7894	33.7008	41.2898
11	32.5604	195.413	168.945	182.179	9.1090	.4790	33.0394	42.1484
12	33.1935	182.493	156.025	169.259	8.4630	.6553	33.8488	42.3118

TABLE 8. OF THE CONVEYANCE OF COMMODITIES.

Exhibiting the actual and equated distances by Railway, as proposed, from the first Depot on Pratt Street, in the City of Baltimore, and 66 feet above the level of mid-tide, to New-Jersey Avenue, in the City of Washington, at a point 40 feet above tide. Likewise the daily cost of a train consisting of one Locomotive Engine and tender, and ten Cars freighted with 30 tons of goods, travelling 8 miles an hour, and performing a circular trip each day, equal to twice the distance between the two cities; and showing the probable cost of fuel, wear and tear, spare Engines, Tenders and Cars, interest and other expenses: also the cost per year of 312 days of the constant working of 1, 2, 3 and 4, such trains; and the capital in present money, equivalent to these expenses, in perpetuity, reckoning interest at 6 per cent. per annum: the whole being calculated for the 12 different routes.

No	Actual distance from 1st Depot, Baltimore, to N. J. Avenue, Washington.	Distance corrected for curvature.	Distance corrected for curvature and grade.	Daily expense per train, or expense per each trip, circular.				Annual expense of motive power, in the transit of commodities, for the year of 312 days.				Capital equivalent to the annual cost of the motive power, just stated			
				Fuel, Anthracite Coal.	Wear & tear of Engine & Cars.	Attendants, interest, & general expenses	Total per day or per trip.	1 train.	2 trains.	3 trains.	4 trains.	1 train.	2 trains.	3 trains.	4 trains.
	Miles	Miles.	Miles.	$	$	$	$	$	$	$	$	$	$	$	$
1	36.2021	37.1618	48.0545	10.5000	9.5700	13.8200	33.8900	10 573.68	21 147.36	29 221.05	37 294.72	176 228	352 456	487 018	621 579
2	36.8352	37.9712	48.2179	10.5359	9.7784	13.8200	34.1343	10 649.80	21 299.60	29 449.41	37 599.20	177 497	354 994	490 824	626 653
3	38.8411	39.6672	49.4014	10.7945	10.2151	13.8200	34.8296	10 866.84	21 733.68	30 100.53	38 467.36	181 114	362 228	501 676	641 123
4	39.4742	40.4766	49.5648	10.8302	10.4234	13.8200	53.0736	10 942.96	21 885.92	30 328.89	38 771.84	182 383	364 766	505 482	646 198
5	38.7254	39.6671	48.9011	10.6852	10.2151	13.8200	34.7203	10 832.73	21 665.46	29 998.20	38 330.92	180 546	361 091	499 970	638 849
6	39.3585	40.4765	49.0645	10.7208	10.4234	13.8200	34.9642	10 908.83	21 817.66	30 226.50	38 635.32	181 814	363 628	503 775	643 922
7	38.2799	39.1547	48.4799	10.5931	10.0831	13.8200	34.4962	10 762.81	21 525.62	29 788.44	38 051.24	179 380	358 760	496 474	634 187
8	38.9131	39.9642	48.6434	10.6288	10.2915	13.8200	34.7403	10 838.97	21 677.94	30 016.92	38 355.88	180 650	361 300	500 282	639 265
9	38.2782	39.2377	48.3387	10.5623	10.1044	13.8200	34.4867	10 759.85	21 519.70	29 779.56	38 039.40	179 331	358 662	496 326	633 990
10	38.9114	40.0472	48.5022	10.5980	10.3129	13.8200	34.7309	10 836.04	21 672.08	30 008.13	38 344.16	180 601	361 202	500 136	639 069
11	38.5604	39.3858	49.3608	10.7857	10.1427	13.8200	34.7484	10 841.50	21 683.00	30 024.51	38 366.00	180 692	361 384	500 409	639 433
12	39.1935	40.1952	49.5242	10.8213	10.3510	13.8200	34.9923	10 917.60	21 835.20	30 252.81	38 670.40	181 960	363 920	504 214	644 507

them, to the President and Directors, on the 22d June, by whom those offered by Mr. John McCartney, a contractor advantageously known to the board, as the builder of the Patterson bridge across the same river, were accepted. Contracts were subsequently prepared by the counsel of the company and duly executed by Mr. McCartney.

This structure was designed by Benjamin H. Latrobe, Esq. and was approved by the Directors. It will be composed of eight arches of fifty-eight feet chord, each. Its height above the level of the water will be seventy feet, and its length seven hundred and seven feet. The exterior wtll be of rustic masonry similar to that of the Patterson bridge. The foundations of the abutments and of all the piers (except two) having been already secured by the vigilance and energy of the contractor, the work may now be prosecuted advantageously, and it is believed will be finished in less than two years from this time.

Proposals were also received, up to the 10th ultimo inclusive, in pursuance of advertisements extensively circulated, for the graduation of the remaining seven sections of the First Division and also for the masonry necessary on that part of the line.

Persons disposed to contract were furnished with printed specifications of the work, descriptive of its extent and character, copies of which are herewith presented, (marked Y and Z.) Every information required was also verbally given by me, on and in the vicinity of the line of the road, where I attended for the purpose of affording such explanations relative to the work, as those disposed to present proposals, might severally desire. The proposals, together with an abstract of them and my views of the value of the difficult parts of the work were, in person, submitted to the consideration of the Board on the 14th ultimo, when all the sections as far as to the 7th inclusive, were awarded to the contractors selected by them.

In compliance with your instructions, advertisements will be published, in the course of two or three days, inviting the presentation of proposals up to the 20th of the ensuing month, for the graduation and masonry of about twenty miles more of the road. This part extends from the end of the First Division on Elk-ridge to the northern boundary line to the District of Columbia, near Bladensburg. There is every reason to believe that competent and efficient contractors may be obtained for the execution of the road-bed-formation of this part of the line, and that labor sufficient for its advantageous completion, in a period of less than two years, will be available.

Time has been given for the completion of the several sections already under contract, in proportion to their magnitude, and this will be done with those to be placed hereafter under contract. By this system the laying of the rails may be commenced early in the next season and afterwards prosecuted simultaneously with the graduation, so that the line may be opened for travel in the course of a few days after the road-bed-formation shall have been finished.

Respectfully submitted,
CASPAR W. WEVER.

[Y]

To Contractors.

The graduation is to be finished at the times stated in the following exhibit, and in the manner described in the printed blank articles of agreement.

The price proposed per yard for the excavation or embankment, as the one or the other, is the greater in quantity, is to be in full for all the work of every kind, necessary to effect the graduation of the section, viz: grubbing, clearing, excavating, embanking, &c.

No ardent spirits to be kept or used on or near the work.

The excavation is believed to be of a quality similar to that between Baltimore and the commencement of the Washington City Branch Road; but such as intend proposing will judge for themselves. They are earnestly requested to give the ground a strict examination, as no extra allowance will be made for rock, hard earth, iron ore, or any other substance which may be met with in the excavations: nor for the occurrence of any unforeseen or unexpected difficulty, such as water, quicksand, &c. &c.

The proposals will inclose the recommendations of the proposers, be sealed up, endorsed with the name of the proposer and the words "*Proposals for Graduation;*" and directed to the subscriber. They may be left on or before the 10th instant, either at the office of the subscriber in Baltimore, at the tavern of Mr. Merrill, on Elk Ridge, or at that of Mr. Roberts at Elk Ridge Landing.

Those whose bids may be accepted by the President and Directors, will be advised by letter without delay, as the work must be actively commenced on or before the 1st day of next month.

CASPAR W. WEVER,
Superintendent.

September 2, 1833.

An Exhibit.

Of the number and length of the sections of the First Division of the lateral rail road, to Washington city, and of the quantum of excavation and embankment on each; and also the time when the graduation of each is required to be completed.

No. of section.	Station of commencement.	Station of termination.	Length of section in feet.	Cubic yards of Excavation.	Cubic yards of Embankment.	When to be completed.
*1	1	36	3256	38,449	39,979	1st day of October, 1834.
2	36	80	4350	77,864	68,136	1st of December, 1834.
3	80	129	4907	49,211	49,683	1st of August, 1834
4	129	169	4000	35,378	35,945	1st of June, 1834.
5	169	206	3704	33,566	45,049	1st of July, 1834.
6	206	260	5375	60,303	62,825	1st of October, 1824.
7	260	293	3300	14,273	18,638	1st of April, 1834.
8	293	356	6266	209,143	35,384	1st of July, 1835.

* This section is under contract.

Disposition of Materials.

2d Section.—Embankment from No. 36 to 45 equal 26,480 yards to be supplied from the excavation ahead of No. 45, average haul 1300 feet. The remaining excavation to No. 80 is equal 51,384 yards, of which quantity 41,656 yards, will go to the embankment between No. 65 and 80, and the residue, 9728 yards will be deposited as follows, viz: 2500 yards to the raising of the Washington Turnpike Road 7 feet to the level of the Rail-road at No. 43, and preserving the grade of the Turnpike so as not to exceed 1 in 13, its present grade, for 150 feet towards the Patapsco, (after which it runs nearly level;) also a portion of this redundant earth will be employed in a new embankment for the Furnace Race opposite No. 72, where, for a short distance, the Race must be removed to make way for the Rail-road embankment. Lastly, the remainder of the 9728 yards will be deposited in the small ravines passed by the embankment, so as to raise their beds in order to drain them by ditches and save culverts that would otherwise be required in addition to those set down in the estimate of masonry. Average distance of transportation of the aforesaid mass of 51,348 yards, say, 1200 feet. Distance through timber land 60 rods.

3d Section.—21,304 yards of excavation from No. 80 to 91, to supply embankment to near No. 95, hauled forward 1000 feet average, 5042 yards of embankment still remaining to No. 98 to be supplied from the excavation ahead to near No. 102, average haul 600 feet. 4624 yards of excavation to No. 106 to be hauled forward to a point back of No. 107, average distance 400 feet. 4112 yards of embankment to No. 111, of which, the quantity of 2454 yards will be furnished from the excavation ahead of No. 109, on to No. 116. A further quantity of 1186 yards from the excavation ahead of No. 123, and the residue equal 472 yards from the nearest convenient earth—average haul of the whole mass 900 feet. 14,601 yards of embankment still left on the section up to No. 124, to be supplied from the excavation between No. 123 and No. 129, haul 700 feet. These two last quantities of excavation and embankment precisely balance each other. The difference between the aggregate excavation and aggregate embankment on the section, being equal 472 yards, as appears from the above. Distance through timbered land 120 rods.

4th Section.—The small embankments as far as No. 144, amounting to 1207 yards, will be made from their adjacent cuttings—haul 200 feet. 7450 yards of embankment between No. 147 and No. 154 to be supplied from the contiguous cuts on each side of it, a distance of 400 feet. 26,721 yards of excavation not used in the fillings aforesaid, and remaining on the section up to No. 159, will be hauled forward to the embankment ahead of No. 158, a distance of, say, 2800 feet. A small deficiency of 567 yards remains to complete the embankment just mentioned, and may be procured from a distance of 200 feet.

5th Section.—32,853 yards of excavation will be furnished from the cutting between No. 169 and No. 183, which, for that purpose, will be made of a width of 34 feet, and will be carried to the adjacent embankment ahead as far as the vicinity of No. 193; average haul, say, 1600 feet. 713 yards of excavation from No. 197 to 206, to be brought back to make the fillings contiguous to it, haul 500 feet. 11,483 yards of deficient embankments to be obtained from the ground south west of Bud's Run, and to the right of the line, and from the ditches for a perfect drainage, average haul 800 feet. There are 25 rods of timbered land on section 5.

6th Section.—11,538 yards of excavation from No. 206 to No. 214, will complete the embankment to a point a little back of No. 226; average haul, 1300 feet. 1902 yards of embankment near the end of the section from No. 258 to No. 260, will be made from the cutting immediately back of it, haul 300 feet. 46,863 yards of excavation remaining, and being from No. 237 to near No. 256, will be hauled back across Deep Run, to the embankment, an average distance of 2200 feet. 2522 yards is the deficiency required for the embankment near Deep Run, and will be supplied from contiguous earth, haul 400 feet. Timber 30 rods. The cuts between No. 206 and 214, and between 237 and 258, will be made 34 feet wide, and this width is employed in the calculations of the foregoing quantities.

7th Section.—2832 yards being the small embankment between Nos. 267 and 278, will be made from the cuttings adjoining to them, average haul, 300 feet. 2135 yards of embankment between Nos. 281 and 284, will likewise be made from their contiguous cuts, haul 300 feet. 9306 yards, the remaining excavation on the section, will be carried to the embankment from No. 286 to No. 293, an average distance, say, 2200 feet. 4365 yards of embankment remain to be supplied from the adjacent banks, or grounds, distance 600 feet.

8th Section.—35,384 yards, the whole of the embankment upon this section will be made from the excavation from the beginning of the section, thence up to a point, a little beyond No. 335; the average haul, 3200 feet. 173,790 yards is the entire residue of excavation on this section up to its termination at No. 356, and being altogether redundant, will be thrown out in spoil-banks, with an average haul, assumed as equivalent to 2000 feet on a level. Timber, 350 rods.

PROPOSAL.

I will graduate the following sections of the First Division of the Lateral Rail Road to Washington city, at the prices set opposite them respectively.

No. of Section.	Price per cubic yard, in cents.
2	
3	
4	
5	

No. of Section.	Price per cubic yard, in cents.
6	
7	
8	

And I will complete said sections satisfactorily, on or before the times set to them respectively, in the preceding Exhibit. The name of my nearest Post Office is
county of and state of

[Z.]

To Contractors.

All the masonry in the bridges shall be of a rubble character, excepting the face work of the abutments, and the sheeting of the arches, and shall be well laid in good mortar.

The faces of the abutments shall be rough in their exterior, but the stone shall be ranged, dressed bed and top, and have vertical joints. The sheeting stone shall be cut or shaped so as to range transversely of the arch, and conform to the radii of the circle or circles of which the arch may be a segment.

The culverts will be of dry rubble masonry, of the best quality;—the bottom of the vents will be flagged, or paved, and the tops covered with strong stone, at least one foot and a half longer than the vent is wide.

The right is reserved to the Baltimore and Ohio Rail Road Company, acting by the Superintendent of the work, to dispense with any of the designated culverts or bridges, or to modify their dimensions.

The actual quantity of perches in each structure, may vary from the estimate, as the estimate is based upon certain depths of foundation, which it may be found necessary to increase or diminish.

The bid as made by the perch must cover expense incurred in the construction of the masonry proposed for, such for instance, as the cost of stone, sand, lime, centres, excavations of foundations, &c. &c. as well as the actual workmanship.

No extra allowance will be made in any contingency.

For a more particular description of the manner of executing for masonry, bidders are referred to the printed articles of agreement.

The culverts must be completed by the 1st December, 1833; and the bridges, on or before the 1st May, 1834.

No ardent spirits to be kept or used on or near the work.

The proposals will inclose the recommendations of the proposers, be sealed up, endorsed "*Proposals for Masonry,*" and directed to the subscriber. They may be left on or before the 10th instant, either at the office of the subscriber, in Baltimore, or at the tavern of Mr. Merrill, on Elk Ridge, or at that of Mr. Roberts, at Elkridge Landing.

Those whose bids may be accepted by the President and Directors, will be advised by letter without delay, as the work must be vigorously commenced on or before the first day of next month.

CASPAR W. WEVER,
Superintendent.

September 2, 1833.

DESCRIPTION,

And estimated quantum of the Masonry required on the Lateral Rail Road to Washington City.

Road Section.			No. of the station the work is on.	Height of the road above stream or drain	Character of structure, whether the bridge or culvert.	No. of arches or vents.	Span of each arch, or dimension of each vent	Estimated No. of perches of 25 cubic feet.	Remarks.
Number.	Station of commencement.	Station of termination							
1*	1	36	12 to 22	66	Bridge	8	58	19.000.	
			25	35	Culvert	1	4 by 5	360.	Great bridge over Patap. at H. Mills
2	36	80	38 & 39	35	Culvert	3	4 by 4	495.	
			51	cut 8.8	Culvert	1	2 by 2	24.	
			70	27	Culvert	1	3 by 4	210.	
			78 & 79	21.5	Culvert	1	2 by 4	148.	
3	80	129	93	35	Culvert	3	3 by 4	520.	Scott's Folly.
			106& 107	21.5	Culvert	1	3 by 4	155.	
			121	25.5	Culvert	1	3 by 4	195.	
4	129	169	132—3	7	Culvert	1	2 by 3	50.	
			151—2	23	Culvert	1	3 by 4	175.	
			165	24.5	Bridge	1	10	950.	Br. of Bud's run
5	169	206	194	30.5	Bridge	1	15	1200.	Bud's run.
6	206	260	227	25	Culvert	2	4 by 6	422.	Lucas' Run.
			234—5	34	Bridge	1	18	1700.	Deep Run.
			241	2.5	Culvert	1	2 by 3	32.	A. Dorsey
			258	11	Culvert	1	2 by 3	70.	spring branch
7	260	293	269	7.5	Culvert	1	2 by 2	38.	
			276	11.5	Culvert	1	2 by 3	72.	
			282—3	13.5	Culvert	1	2 by 2	54.	
			289—90	21.5	Culvest	1	2 by 3	108.	
8	293	356	297	24.5	Culvert	2	3 by 6	415	Licking creek.
							Total,	26.363.	

*The masonry on this section is under contract.

PROROSAL.

I will build the necessary Culverts and Bridges on the several sections of the First Division of the Lateral Rail Road to Washington City, in the manner and by the time required, at the following prices, viz.

No. of section.	Bridges per perch.		Culverts per perch.	
	Dolls.	Cents.	Dolls	Cents.
2				
3				
4				
5				
6				
7				
8				

The name of my nearest post office is
County of
and State of

[F]

Office of the Superintendent of
Machinery, Oct. 1st. 1833.

To Philip E. Thomas,
President of the Balt. & Ohio Rail Road Co.

In making the annual report of the department of Machinery on the Baltimore and Ohio Rail Road, the Superintendent will take occasion to lay before the Board a statement of the number and condition of the Cars now upon the road, whether for the transportation of passengers or of burden. It is also deemed proper, as a constituent part of such a report, to mention the different alterations and improvements that have been suggested and attenpted to be made, in the machinery during the present year.

It would be a source of real gratification to the undersigned to have it in his power to enumerate such a list of economical and substantial improvements in the machinery, as would open a reasonable prospect of effecting a reduction in the expenses of transportation, to an amount that would be encouraging and animating to every one connected with this magnificent scheme of public improvement. But in defiance of every effort to overcome resistance, to lessen friction, and prevent the wear of machinery that physicala xiom that "action and reaction are equal," remains to be invincibly true.

The wear of machinery is found to be very great and particularly of the wheels. When the first cost of burden cars, coaches, and engines, is taken into consideration, together with the frequent necessity of repairs, these must constitute a very heavy item in the expenses of transportation on the road. Your superintendent has made every personal exertion and called into exercise whatever powers of invention he possesses to discover the means of lightening the expenditures of the department, how far he has succeeded in this endeavour time will discover.

In the developement of the facts which experience and close observation have elicited, the undersigned is encouraged to hope that some discoveries that have been made, and some others that have been suggested, but not yet satisfactorily tested, may not only be found to answer a valuable purpose, but also to open the way for further improvement.

In the commencement of operations upon the road, when the wheels were made of soft metal,and when it was considered a matter of importance that they should be made light, so rapid was the wear and so incessant was the breakage, that to find out some means of obviating this condition of things, was viewed as a very important desideratum. The chilling of that part of the wheel which comes in contact with the iron rail on the road, was the first step in the progress of improvement, and sanguine hopes were entertained that this process would operate as a complete corrective, but after trial had for some time been made, it was found, with the information then before us, impossible to chill the cone of the wheel in the same degree with the horizontal part of it, nor could it be chilled equally through all its parts, consequently the attrition was unequal. The cone was soon worn down to a level with the other part, and thereby the advantage of it lost, besides the metal being unequally chilled in the conical part of the wheel, it wore faster in the softer than the harder parts, which destroyed the circularity of the wheel, and consequently the uniformity of the motion Remedy appeared to be hopeless, until it was suggested that by placing a ring of wrought iron in such a position, that when the wheel is cast, the ring might be inclosed in the metal in the immediate vicinity of the cone, and effect a complete chill, and by that means bring the whole surface of the wheel that came in contact with the road to an equal degree of hardness. The first attempts that were made to cast wheels upon this plan, did not succed according to expectation, but some more recent trials show that the difficulty is not insurmountable, and promise a happy result.

Experience has demonstrated that the use of springs on all the carriages, whether for the transportation of passengers, or of merchandize would contribute greatly to the preservation, both of the cars and of the road. Such an arrangement would assist in regulating the motion, and serve in some measure to alleviate the sharp jar inseparable from the sudden and violent collision of two hard bodies and no mitigating medium, and thus save both the cars and the road from that racking concussion which no perfection of construction, nor any reasonable care and foresight to prevent every accident, can entirely obviate.

The Locomotive Atlantic has been employed upon the road, sometimes transporting passengers and sometimes drawing burden cars during the past year, as constantly and effectively as one engine could reasonably be expected to act. It has travelled 13,280 miles and the quantity of coal consumed was 190 tons, costing eight dollars per ton.

The Locomotive Indian Chief, under the new name of the Traveller, has been undergoing a thorough course of alterations which are now completed, and it has within a very few days past been placed upon the road. The shortness of the time has denied a fair opportunity of fully testing its powers; but the partial trials that have been made appear satisfactory, and to promise an efficient performance. The boiler seems to be capable of generating an abundant supply of steam. The alterations that have been made in the manner of gearing, added to the advantage of being placed upon powerful springs it is expected will in a great measure relieve the jar, and alleviate the pressure of so great a weight upon the road.

The conveyance of baggage on the tops of the passenger cars has been attended with so much labour and inconvenience in loading unloading and shifting the baggage, at so great a height, added to the manifest injury done to the cars in the hurry and bustle of these operations, that the necessity of some improvement on the present plan is obviously indispensable. It is proposed to construct some cars as tenders to the passenger trains, for the exclusive purpose of carrying baggage, and in constructing them to make two distinct apartments, and for the baggage going to the ultimate point of destination, which will remain undisturbed the whole trip, the other for the accommodation of way passengers.

Every day's observation and experience points out the propriety, and even the necessity, of making some little alteration and improvements in the minor details of the department. The undersigned under the weight of obligation which rests upon him, feels himself bound to endeavour by all reasonable and available means, to reduce in whatever relates to the particular department committed to his charge, the heavy expense of transportation on the road, and thereby promote the interests of the company.

During the past summer two very substantial and commodious shops have been erected at depot A., one 155 feet long by 30 feet wide for the construction of Engines, containing two Smiths fires, another 88 by 33 feet, containing 5 Smiths fires and two cupola furnaces, where the smith work and castings may hereafter be done.

When the necessary fixtures and arrangements are completed, the construction of Locomotive Engines, the castings and smith work, can all be performed in one place, with united and simultaneous effort.

In the course of the year the following description of burden cars and coaches have been constructed, viz.

55 House cars for merchandize.
61 Box cars for coal, lime, plaister, &c.
13 Horse cars.
10 Barrel cars.
4 Large house cars with births for workmen to lodge in.
3 Tenders for Engines.

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3 Coaches, President, Patapsco and Carroll.
There are in progress of construction,
1 Car body nearly finished.
3 do. do. to form one coach on 8 wheels, to carry 60 passengers.
1 Car body to carry 24 passengers.
1 do. do. exclusively for baggage.
50 Wagon frames ready to be placed upon wheels.
On hand 75,000 feet ash and other lumber.
750 Whole number of burden cars on the road.
37 do. do. passenger cars.

787 Total number of cars and carriages.

There has been a building for the accommodation of Engines constructed at depot A. 100 feet long, by 14 feet 10 inches wide. A smith shop and tools, 28 by 22 feet, one shed building for cars at the depot on Charles street, also an inclined plane and platform for painting cars and conveying them and the burden cars to the road.

For a detailed statement of the expenditures of this department I refer to the annexed document, marked M.

Respectfully submitted,
GEORGE GILLINGHAM,
Supt. of Machinery.
B. & O. R. R.

[M]

An abstract of expenditures by George Gillingham, Superintendent of Machinery, of the Baltimore and Ohio Rail Road, for the year ending September 30th, 1833.

Expenditures for the construction of burden cars,	35.189	70¾
Expenditures for the construction of passen. cars,	2.569	77
Expenditures for the repairs of burden cars,	4.627	20½
Expenditures for the repairs of passenger cars,	2.296	79
Expenditures for the repairs, &c. of L. Engines,	*5.151	89¼
Contingent expenses, - - - -	†3.503	53¼
	$53.347	89¾

* It may be proper to remark, that this sum includes the pay of Engineers, fuel, and various expenditures for new work and alterations, in addition to the amount expended for repairs, properly speaking.

† This sum includes the amount paid for oil, for the erection of a Smiths shop and an Engine house at depot A. a shed building for cars, and an inclined plane and platform for painting cars at the depot on Charles street, and several other expenditures not properly appertaining to this department.

[G.]

Office of Transportation,
B. & O. R. R. Co. Oct. 1st. 1833

Philip E. Thomas, Esq.
President,

Sir,—The following report and the several Tables and statements that accompany it, marked No. 1, to 6, exhibiting in detail the operations of the department of transportation for the past year, are respectfully submitted to you.

On referring to these Documents it will be perceived that by No. 1, to 3, the receipts of the company have, during that period, amounted to $195,679.72, of which $112,446.48 have been derived from the transportation of tons 62,755 : 3 : 1:—and $83,233.24 from the conveyance of 88,639 passengers. By adverting to papers Nos. 4 & 5, it will also be seen that the expenses incurred in transportation have amounted to $83880.75, to this are to be added the sums expended for the repairs of machinery and of the railway, amounting to $47,003.61.

In comparing the operations of the year just expired, with those of the preceding, a most gratifying improvement will be found to have taken place in every branch of the revenue;—and on referring to the last report made by this department, it will be seen that the income of the road for this year was then estimated at $182,000; whilst it will be found by the returns now submitted, to have exceeded $195,000. This is the more encouraging as it will be perceived that, for some time past, each succeeding month has presented this result in an increasing ratio.

To exhibit this subject in detail, the following table is submitted, shewing, relatively, the receipts for the last six months, and those for the corresponding months of the preceding year. By this exhibit it will be remarked, that an aggregate increase has taken place in the six months of $18,383.14, viz.

Revenue				*Revenue.*	*Increase.*
for April	1832	$14,998.77	1833	20,023.25	$5,024.48
May	"	16,483.39	"	*17,014.07	530.68
June	"	14,548.65	"	*16,736.79	2,188.14
July	"	14,008.06	"	17,171.56	3,163.50
August	"	16,068.46	"	20,122.64	4,054.18
September	"	14,895.35	"	18,317.51	3,422.16
		$91,002.68		$109,385.82	$18,383.14

By comparing the various sources of revenue, forming the general receipts of the two periods, it will be seen that each item of income has, during the present year, been improved, and that this has been effected, not only from the business of the adjacent country having been more generally attracted to this road, but by the increase of the several branches of traffic which have been created by the Rail Road itself.

Among these may be enumerated the article of granite,—from this commodity the revenue during the last six months has been $6231.20, whilst during the corresponding period of the preceding year it was only $2383.05 showing an increase since the 1st of April of the present year of $3,848.12.

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* The falling off in revenue in these two months arose from the prevalence of the cholera in the West, and especially at Wheeling during that period.

This fact is interesting not only from the assurance it affords of the increasing profit this commodity will yield to the Rail Road, but from the importance it is likely to assume as an export of this city, employing as it already does a very considerable number of persons in its manipulation.

It has been found, also, that since the knowledge of the cheapness and beauty of this material has become more diffused, the demand has greatly increased, and from the same cause it will gradually become an object of great value to the road. As an article of transportation it is highly advantageous, being burthened with few changes, and, in its conveyance, favoured with a descending grade of Railway, it leaves a very considerable net profit to the company.

Together with granite may be enumerated lime, marble of a superior description, lately discovered near the line of the Railway, and slate, all of which are affording increased returns to this Road, and relatively to the section of country traversed by this work, have become,by its agency, objects of commerce and revenue to it.

Another source of income which has exceeded the anticipations that were generally formed of it, is the conveyance of passengers between Frederick and Baltimore,—it is believed that, prior to the commencement of the Rail Road, the travellers passing between those places, in the public conveyances, did not average daily more than from 10 to 12; whilst the number conveyed for six months past, between the same cities on the Rail Road, has exceeded 119 per day;—requiring for their accommodation, the passage, in the two directions, of twelve cars daily.

These facts are the more satisfactory as they sanction the high expectations that may be formed of an increased commerce being attracted to this Road by its extension, and by the completion of the Rail Roads about being made in connexion with it. They are encouraging results, also, relatively to those works, as they afford conclusive evidence of the great accession to the existing travelling and transportation on their respective routes, which will be produced by the facilities they will offer, and of the benefit they will thus derive from the commerce they will themselves create.

On referring to the several tables accompanying this report, it will be remarked, that, although the ratio of the expenses of transportation to the revenue has been materially reduced, yet those expenses are still relatively high;—this result is to a great degree caused by the cost of conveyance within the city, and of that over Parr's Ridge—and although in the location of the inclined planes on that Ridge every resource of science and experience was applied to diminish, as far as possible, the embarrassment its great elevation would occasion, it could not fail under any arrangement to be a serious source of expense.

The expenditures at this point are caused by the great extent of animal power required to transport tonnage to the summit of the planes, and by the number of men which are found necessary to insure its secure descent to their base;—and these expenses, consistently with the safety and efficiency of this service, cannot be reduced; neither, with the limited business of the road, can any other kind of power be introduced with equal economy. It will be recollected, however, that the present system of operations with animal power on this portion of the road is merely a substitute for the stationary steam engine, which it is intended to adopt when the amount of tonnage to be transported shall warrant its use;—but as this descripition of power is, to a great degree, subject to a fixed rate of expense, not materially influenced by the increased or diminished use to which it is applied,—it would probably prove, at this time, more costly than the present system:—when, however, the business of the company shall have been augmented to an adequate extent, the actual cost of the conveyance, by stationary engines, of each wagon over the Ridge will be greatly reduced.

The expenses of transportation within the city, lately alluded to, are referable to the same causes as those on the Ridge—the sudden ascents and descents of Pratt street, requiring, as in that case, the employment of a considerable body of men and horses.

The cost of conveyance on this Railway in the streets of Baltimore, is now adverted to merely as explanatory of one of the causes of the high rate of expenses necessarily incurred by this company:—the general economy of this plan, however, over any other means of transportation within a city, cannot fail to be conceded. The advantages of it to Baltimore will also be admitted on other grounds, as in the competition for the supply of the interior, in which she must ever be engaged with other cities, it is obviously to her a matter of the highest importance, that incidental charges should, as far as possible, be avoided, forming as they do to the Western merchant, a part of the cost of the commodities purchased in this city. By the facilities offered by the Railway on Pratt street, the injury to which the general commerce of Baltimore might be exposed by the charge for the ordinary conveyance through the city, to the Rail Road beyond its limits, is removed;—and the merchant from the interior is, by the extension of this work into the town, enabled to deposit his commodities on the Rail Road wagon at the point at which his purchases are made, and receive them, on the following day, at the other extremity of the road.

The extent of the unfavourable result produced by the two items of expense adverted to, operating as they do on a rate of tolls lower, it is believed, than those on any other rail road whatever, may be inferred from the fact that for one of those items alone—the conveyance over the Ridge—the cost to this company is equal to that incurred in the transit of twenty miles of ordinary Rail-road:—and in the case of the transportation to and from Frederick—the charge for conveyance, with the extra expense incurred at the planes, is equal to that for eighty miles of distance, whilst the tolls received are only for the actual distance of sixty miles.

Although the operation of these causes affect disadvantageously at this time the comparative rates of expenses and receipts, it will be perceived that, in proportion as the road is extended westwardly, their effect will be diminished;—and this fact is the more satisfactory, as it is known that for a distance of one hundred and fifty miles from Parr's Ridge, there will be no recurrence of inclined planes on this work.

The cost of repairs of the Rail-road will be found by statement No. 5, to have been considerable during the past year. The superintendence of this branch of the service was, during the 1st, 2d, and 3d quarters of the past year, under the direction of the superintendents of the department of construction and repairs of those periods;—since the 1st of July last its duties have been incorporated with those of the department of transportation.

During the present summer the Railway has undergone a thorough repair, and has been perfectly adjusted. *The cost of repairs during the year divide themselves into the following heads, viz.

Repairs of Stone Railway - - - -	$8,662.15
Do " wood " - - - - -	6,376.00
Do " Horse Path - - - - -	11,188.79
Do " of Embankments, opening drains, removing Slips, &c. &c. - - - -	5,033.04
Contingencies, - - - - -	293.06
	$31,553.04

In proportion to its extent, the adjustment of the stone railway has been the most costly, owing to the character of this description of road. These repairs have been occasioned by the settling of the sills on the embankments, by the inequalities which had arisen at their junctions; and, in some cases, by the

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* A small portion of stone block Road on the first division is not yet finished but will be completed next month.

granite having become decomposed by the action of the weather and by the pressure of the loaded cars.

As these repairs arose from original defects, unavoidable and peculiar to the newness of the structure, being now, as it is believed, effectually remedied, the track may be presumed, after the sound work has, for so long a period, stood the test of daily use and after all the weak portions have been thus strengthened, to be in a more permanently good state than at any previous period.

In relation to the expenditure of $11,188.79 for repairs of the horse-path, it may be observed that this track was originally made in a temporary manner, and generally, of the cheapest materials, as it was expected that steam would in a short period, have superseded animal power, when the path would have been dispensed with; and, further, as considerable settlements would take place, the materials first laid down, however good they might be, would to a certain extent be lost by the subsequent raising of the rails.

The horse track having now been in use for two seasons, and the company not having yet been enabled adequately to supply themselves with steam power, it had become necessary that some extensive repairs should be made to preserve the path in travelling order during the next winter and spring. Those repairs were accordingly applied, but under similar restrictions to those first adopted, as steam power will, it is expected, during the next year render a large extent of horse track superfluous: and, in this respect alone, independent of the superior efficiency and cheapness of the Locomotive Engine over horses as a moving power, its adoption on this road will be a matter of vast importance, saving as it will a great yearly outlay in repairs of the horse track.

During the last year many facilities have been provided on the Rail Road to enable the public to avail themselves more generally of its advantages.

Among the works that have with this view been erected may be noted the commodious warehouse and machinery which the Company have constructed at each of their depots.

The objects which it was by these means sought to attain were the facilities they would afford to the public, and especially to persons living remote from the line of the road, of forwarding their produce directly to the charge of the Conpany, for conveyance on the road to its consignees: it was also intended to offer to such individuals the means of depositing their goods in these warehouses until their convenience or leisure might enable them to receive them.

The great aim in these improvements was to diffuse more extensively the benefits of the system, and in pursuance of the obvious policy of the Company,—not only to secure to the public by this work a cheap and expeditious means of intercommunication, but, as far as possible, to relieve them from all incidental charges in availing themselves of those facilities.

In reference to the actual and prospective condition of the commerce and revenue of the road it will be remarked that a great improvement has taken place in both respects during the present summer, and, although it has produced a great augmentation in the receipts for a few months past, it is yet too recent to affect equally the revenue of the entire year. As this improvement has been caused by the use of the Rail Road having been adopted through a more extensive area of country than had previously been connected with it, it may be considered as permanent, and will produce a more decided effect in its future operations.

The benefits also to this work of its connection with the Potomac may be expected to increase during the present year. Hitherto, although, much produce has been attracted to Baltimore from Virginia that would, without its facilities, have sought other markets, yet the local impediments to the business of the Company at the Point of Rocks have prevented its full developement. These difficulties to an easy communication with the neighbouring portions of Virginia, have been occasioned by the uncertain and tardy ascending navigation of the Potomac from the Point of Rocks, and by the obstructions which have existed to the conveyance of commodities from the River to the Rail Road—the Canal in an unfinished state being situated intermediately between the two channels of communication. These embarrassments will be effectually remedied by the extension of this work to Harper's Ferry, as well as by the opening of the navigation of the Canal to that point. On either of these events taking place a very decided improvement may be anticipated in the transportation of the Company, as it will immediately and intimately connect that City with a section of country that has hitherto almost exclusively sought other markets for the sale of its produce, and for the purchase of its supplies. As soon as this line of communication shall be opened, the Rail Road will receive also the conveyance of the commodities which may be purchased in this and the Northern Cities for the country connected with the Canal and the Potomac. As this branch of commerce consists chiefly of valuable goods of foreign or domestic manufacture, it will, from the greater certainty, safety and economy of the route, seek the line of internal communication between those cities and Baltimore, and, for the same reasons, from the latter, it will again be forwarded by the Rail Road to the Point of Rocks.

Under the influence of these considerations it can scarcely be doubted that the business of the next year will exhibit a very decided improvement; and it may further be remarked that the line of road to the Potomac being more extended than that traversed by the greater portion of the present traffic of the Company will, therefore produce relatively a greater amount of Revenue—having also a longer line of easy transit beyond the inclined Planes, the charges, peculiar to the conveyance at that place and in the City, will be diminished in their ratio to the general expenses,—and the net revenue the Company will derive from this transportation will, in consequence, be still further enhanced beyond that received by them from their present business.

Respectfully submitted

W. WOODVILLE.

Superintendent.

No. 1.

Statement of the Revenue received for the transportation of Passengers on the Baltimore and Ohio Rail Road, from the undermentioned places, respectively, from the 1st of October, 1832, to the 30th September, 1833, inclusive, viz:

REVENUE FROM PASSENGERS:

During the Month of	Baltimore.		Ellicott's Mills.		Frederick.		Point of Rocks.		Total.	
	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.
October,	3,621	$3,334.90	1,034	$473.71	1,546	$2,240.44	204	$237.01	6 ,405	$6,286.06
November,	3,540	3,390.44	898	437.20	1,398	2,005.93	276	270.87	6,112	6,104.44
December,	3,026	2,940.72	933	456.20	1,362	1,765.89	316	313.41	5,637	5,476.22
January,	1,916	1,860.68	520	262.16	1,086	1,458.15	226	233.52	3,748	3,814.51
February,	1,820	1,778.55	265	273.41	1,217	1,609.72	223	239.76	3,525	3,901.44
March,	2,297	2,095.85	564	274.30	1,603	2,430.76	247	337.32	4,711	5,138.23
April,	3,824	3,990.03	941	467.89	1,756	2,541.10	329	419.25	6,850	7,418.27
May,	4,352	3,936.19	1,083	483.11	2,035	2,942.86	428	449.83	7,898	7,811.99
June,	5,345	3,914.32	1,820	809.06	1,926	2,602.39	442	550.40	9,533	7,906.17
July,	6,444	4,616.78	2,461	1,026.60	2,727	3,472.99	739	616.62	12,374	9,732.99
August,	6,194	5,181.20	2,404	991.95	2,710	3,585.69	641	615.16	11,949	10,377.00
September,	4,913	4,615.56	2,043	836.42	2,394	3,216.97	541	566.97	9,891	9,265.92
Total,	47,292	41,715.22	14,969	6,795.01	21,760	29,872.89	4,612	4,850.12	88,633	83,233.24

No. 2.

Statement of the Revenue received for the Transportation of Tonnage on the Baltimore and Ohio Rail Road, from the 1st October, 1832, to the 30th September, 1833.

During the Month of	Westwardly.		Eastwardly.		Total.	
	Tonnage.	Amount.	Tonnage.	Aomunt.	Tonnage.	Amount.
October,	2,433. 3. 2.1	6,105.03	2,276.11.3.14	3,427.99	4,709.15.2. 7	9,533.02
November,	2,325.13.1.21	5,334.89	3,092. 9.3. 0	4,677.12	5,418. 3.0.21	10,012.01
December,	2,019. 8.3.21	4,749.98	3,300. 3.2.21	5,349.42	5.319.12.2.14	10,099.40
January,	1,565. 4.0. 7	2,984.01	2,873. 9.3. 7	5,205.14	4,438.13.3.14	8,189.15
February,	1,587.15.3. 7	3,183 73	2,358.11.3.14	4,635.65	3,946. 7.2.21	7,819.38
March,	2,047. 0.1.21	4,216.07	2,656. 4.3.21	5,703.97	4,703. 5.1.14	9,920.04
April,	2,926.18.0. 0	7,558.39	2,660.17.1. 7	5,046.59	5,587.15.1. 7	12,604.98
May,	1,992. 0.2.14	4,846.86	2,196.12.3. 7	4,355.22	4,188.13.1.21	9,202.08
June,	1,785. 2.0. 7	4,110.16	2,514. 1.0. 7	4,720.46	4,299. 3.0.14	8,830.62
July,	1.965.16.1. 7	3,681.00	2,944.19.3. 7	3,757.57	4,910.16.0.14	7,438.57
August,	2,230.14.0.21	4,456.39	5,697. 6.2. 7	5,289.26	7,928. 0.3. 0	9,745.64
September,	2,710. 6.2. 0	5,324.09	4,594. 9.2.21	3,727.50	7,304.16.0.21	9,051.59
Total	25,589. 4.0. 7	56,550.59	37,165.19.0.21	55,895.89	62,755. 3.1. 0	112 446.48

No. 3.

Statement of the Aggregate Revenue received on the Baltimore and Ohio Rail Road, from the 1st October, 1832, to the 30th September, 1833, viz:

During the Month of	From Passengers.		From Tonnage.		Total.
	Passengers.	Amount.	Tons. cwt. qr. lb.	Amount.	
October,	6,405	$ 6,286.06	4,709.15.2. 7	9,533.02	15,819.08
November,	6,112	6,104.44	5,418. 3.0.21	10,012.01	16,116.45
December,	5,637	5,476.22	5,319.12.2.14	10,099.40	15,575.62
January,	3,748	3,814.51	4,438.13.3.14	8,189.15	12,003.66
February,	3,525	3,901.44	3,946. 7.2.21	7,819.38	11,720.82
March,	4,711	5,138.23	4,703. 5.1.14	9,920.04	15,058.27
April,	6,850	7,418.27	5,587.15.1. 7	12,604.98	20,023.25
May,	7,898	7,811.99	4,188.13.1.21	9,202.08	17,014.07
June,	9,533	7,906.17	4,299. 3.0.14	8,830.62	16,736.79
July,	12,374	9,732.99	4,910.16.0.14	7,438.57	17,171.56
August,	11,949	10,377.00	7,928. 0.3. 0	9,745.64	20,122.64
September	9,891	9,265.92	7,304.16.0.21	9,051.59	18,317.51
Total	88,633	$83,233.24	62,755. 3.1. 0	$112,446.48	$195,679.72

RECAPITULATION.

Transportation.	Revenue.
88,633 Passengers.	$83,233.24
62,755:3:1:0 Tons.	112,446.48
Total, - -	$ 195,679.72

No. 4.

A Statement of the Expenses of Transportation from the 1st October, 1832, to the 30th September, 1833; exhibiting, also, the proportion of Expenses appertaining to the Transportation of Passengers and of Tonnage, respectively, viz:

During the Month of	Expenses for Passengers.	Expenses for Tonnage.	Total.
October, 1832, -	3,080.85	3,699.50	6,780.35
November, - -	3,345.18	3,982.00	7,327.18
December, - -	3,337.24	3,994.50	7,331.74
January, 1833, -	2,907.00	3,456.78	6,363.78
February, - -	2,742.26	3,353.30	6,095.56
March, - -	3,061.50	3,493.44	6,554.94
April, - - -	3,412.75	4,072.50	7,485.25
May, - - -	3,394.64	3,643.62	7,038.26
June, - - -	3,422.06	3,574.50	6,996.56
July, - - -	3,680.90	3,533.16	7,214.06
August, - -	3,684.43	3,780.19	7,464.62
September, - -	3,611.18	3,587.27	7,228.45
	39,709.99	44,170.76	$83,880.75

An increase in the expenses was caused in November and the following months, by the general transportation of the company having been transferred to a lower point in the City.

No. 5.

General Statement of Receipts and Expenses of the Baltimore and Ohio Rail Road Company, from the 1st October, 1832, to the 30th September, 1833, embracing the amounts disbursed for Transportation, and for the maintenance and repairs of the Railway, and of Machinery, by the Superintendents, respectively, charged with those Departments.

EXPENDITURES.			RECEIPTS.		
Expenses of Transportation.—			Revenue from Tonnage, -	$112,446.48	
Amount disbursed by the Superintendent of Transportation, for this account, - - - -	- -	$83,880.75	do. Passengers,	83,233.26	195,679.72
Repairs.—					
Amount disbursed by the Superintendent of Machinery, for repairs of Coaches, Wagons and Locomotive, and for use of same;—for cost of Oil, together with salary of said superintendent, -	$15,450.57				
Amounts disbursed for repairs of Railway, during the 1st, 2d and 3d quarters of past year, by the Superintendents of Construction; and during the 4th quarter, by the Superintendent of Transportation,	31,553.04	47,003.61			
Estimated wear and tear, &c. of Horses and Harness, together with salary of Superintendent of Transportation		7,600.00			
Net Revenue, - - - - - - - - -		57,195.36			
		$ 195,679.72			$ 195,679.72

TABLE 10.

Comparison of Routes No. 1, 3, 5, 7, 9, 11, that cross the Patapsco River near Dennis A. Smith's Bridge.

		No. 1.—UPPER ROUTE.				No. 3.—LOWERMOST ROUTE.				No. 5.—CLARK ROUTE.				No. 7.—MILL ROUTE.				No. 9.—HALL ROUTE.				No. 11.—INTERMEDIATE ROUTE.			
					Miles.				*Miles.*				*Miles.*				*Miles.*				*Miles*				*Miles.*
		Baltimore & Ohio Rail Road,		-	6.0000	Baltimore & Ohio Rail Road,		-	6.0000	Baltimore & Ohio Rail Road,		-	6.0000	Baltimore & Ohio Rail Road,		-	6.0000	Baltimore & Ohio Rail Road,		-	6.0000	Baltimore & Ohio Rail Road,		-	6.0000
		Lateral Road to Washington,		-	30.2021	Lateral Road to Washington,		-	32.8411	Lateral Road to Washington,		-	32.7254	Lateral Road to Washington,		-	32.2799	Lateral Road to Washington,		-	32.2782	Lateral Road to Washington,		-	32.5604
		Baltimore to Washington,		=	36.2021	Baltimore to Washington,		=	38.8411	Baltimore to Washington,		=	38.7254	Baltimore to Washington,		=	38.2799	Baltimore to Washington,		=	38.2782	Baltimore to Washington,		=	38.5604
		Actual and equivalent Capital.	Annual charge	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.
		$		$		$		$		$		$													
Construction.	Masonry and Bridging, plus 10 per cent.	280 525	16 831.50	280 525	16 831.50	276 537	16 592.22	276 537	16 592.22	281 841	16 910.46	281 841	16 910.46	281 752	16 905.12	281 752	16 905.12	278 176	16 690.56	278 176	16 690.56	277 168	16 630.08	277 168	16 630.08
	Graduation, adding 10 per cent.	748 706	44 922.36	1 029 231	61 753.86	677 046	40 622.76	953 583	57 214.98	760 581	45 634.86	1 042 422	62 545.32	754 690	45 281.40	1 036 442	62 186.52	792 953	47 577.18	1 071 129	64 267.74	682 034	40 922.04	959 202	57 552.12
	Railway, double track, and Contingencies,	437 930	26 275.80	1 467 161	88 029.66	476 196	28 571.76	1 429 779	85 786.74	474 518	28 471.08	1 516 940	91 016.40	468 058	28 083.48	1 504 500	90 270.00	468 033	28 081.98	1 539 162	92 349.72	472 126	28 327.56	1 431 328	85 879.68
Repairs.	Extraordinary repairs of Graduation, plus 10 per cent.	59 796	3 587.76	1 526 957	91 617.42	58 862	3 531.72	1 488 641	89 318.46	65 416	3 924.96	1 582 356	94 941.36	63 839	3 830.34	1 568 339	94 100.34	67 157	4 029.42	1 606 319	96 379.14	58 827	3 529.62	1 490 155	89 409.30
	Ordinary repairs of Graduation and Masonry, with Superintendence,	156 668	9 400.10	1 683 625	101 017.52	141 523	8 491.37	1 630 164	97 809.83	147 296	8 837.73	1 729 652	103 779.09	148 798	8 927.89	1 717 137	103 028.23	158 974	9 538.44	1 765 293	105 917.58	144 587	8 675.24	1 634 742	98 084.54
	Repairs and renewals of Railway, double track,	201 347	12 080.84	1 884 972	113 098.36	218 941	13 136.44	1 849 105	110 946.27	218 169	13 090.16	1 947 821	116 869.25	215 199	12 911.96	1 932 336	115 940.19	215 188	12 911.28	1 980 481	118 828.86	217 069	13 024.16	1 851 811	111 108.70
Motive power and Machinery.	1st. Locomotive Engine and train of 10 Cars, with 30 tons of freight,	176 228	10 573.68	2 061 200	123 672.04	181 114	10 866.84	2 030 219	121 813.11	180 546	10 832.73	2 128 367	127 701.98	179 380	10 762.81	2 111 716	126 703.00	179 331	10 759.85	2 159 812	129 588.71	180 692	10 841.50	2 032 503	121 950.20
	1st. Locomotive Engine and train of 6 Coaches, carrying 67 passengers,	224 597	13 475.80	2 285 797	137 147.84	231 325	13 879.49	2 261 544	135 692.60	230 771	13 846.28	2 359 138	141 548.26	229 234	13 754.04	2 340 950	140 457.04	229 251	13 755.03	2 389 063	143 343.74	230 691	13 841.46	2 263 194	135 791.66
	2d. Locomotive Engine and train with 30 tons of freight,	176 228	10 573.68	2 462 025	147 721.52	181 114	10 866.84	2 442 658	146 559.44	180 546	10 832.73	2 539 684	152 380.99	179 380	10 762.81	2 520 330	151 219.85	179 331	10 759.85	2 568 394	154 103.59	180 692	10 841.50	2 443 886	146 633.16
	2d. Locomotive Engine and train, carrying 67 passengers,	224 597	13 475.80	2 686 622	161 197.32	231 325	13 879.49	2 673 983	160 438.93	230 771	13 846.28	2 770 455	166 227.27	229 234	13 754.04	2 749 564	164 973.89	229 251	13 755.03	2 797 645	167 858.62	230 691	13 841.46	4 674 577	160 474.62
	3rd. Locomotive Engine and train with 30 tons of freight,	162 339	9 740.35	2 848 961	170 937.67	167 225	10 033.51	2 841 208	170 472.44	166 657	9 999.40	2 937 112	176 226.67	165 491	9 929.48	2 915 055	174 903.37	165 442	9 926.52	2 963 087	177 785.14	166 803	10 008.17	2 841 380	170 482.79
	3rd. Locomotive Engine and train with 67 passengers,	224 597	13 475.80	3 073 558	184 413.47	231 325	13 879.49	3 072 533	184 351.93	230 771	13 846.28	3 167 883	190 072.95	229 234	13 754.04	3 144 289	188 657.41	229 251	13 755.03	3 192 338	191 540.17	230 691	13 841.46	3 072 071	184 324.25
	4th. Locomotive Engine and train with 30 tons of freight,	155 395	9 323.68	3 228 953	193 737.15	160 281	9 616.84	3 232 814	193 968.77	159 712	9 582.73	3 327 595	199 655.68	158 547	9 512.81	3 802 836	198 170.22	158 498	9 509.85	3 350 836	201 050.02	159 858	9 591.50	3 231 929	193 915.75
	4th. Locomotive Engine and train, conveying 67 passengers,	224 597	13 475.80	3 453 550	207 212.95	231 325	13 879.49	3 464 139	207 848.26	230 771	13 846.28	3 558 366	213 501.96	229 234	13 754.04	3 532 070	211 924.26	229 251	13 755.03	3 580 087	214 805.05	230 691	13 841.46	3 462 620	207 757.21

Comparison of Routes No. 2, 4, 6, 8, 10, 12, that cross the Patapsco River, at Hockey Mill.

		No. 2.—UPPER ROUTE.				No. 4.—LOWERMOST ROUTE.				No. 6.—CLARK ROUTE.				No. 8.—MILL ROUTE.				No. 10.—HALL ROUTE.				No. 12.—INTERMEDIATE ROUTE.			
					Miles.				*Miles.*				*Miles.*				*Miles*				*Miles*				*Miles.*
		Baltimore & Ohio Rail Road,		-	6.9883	Baltimore & Ohio Rail Road,		-	6.9883	Baltimore & Ohio Rail Road,		-	6.9883	Baltimore and Ohio Rail Road,		-	6.9883	Baltimore & Ohio Rail Road,		-	6.9883	Baltimore & Ohio Rail Road,		-	6.9883
		Lateral Road to Washington,		-	29.8469	Lateral Road to Washington,		-	32.4859	Lateral Road to Washington,		-	32.3702	Lateral Road to Washington,		-	31.9248	Lateral Road to Washington,		-	31.9231	Lateral Road to Washington,		-	32.2052
		Baltimore to Washington,		=	36.8352	Baltimore to Washington,		=	39.4742	Baltimore to Washington,		=	39.3585	Baltimore to Washington,		=	38.9131	Baltimore to Washington,		=	38.9114	Baltimore to Washington,		=	39.1935
		Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.	Actual and equivalent capital.	Annual charges.	Total capital.	Total annual charges.
		$		$		$		$		$															
Construction.	Masonry and Bridging, plus 10 per cent,	303 746	18 224.76	303 746	18 224.76	299 758	17 985.48	299 758	17 985.48	305 062	18 303.72	305 062	18 303.72	304 973	18 298.38	304 973	18 298.38	301 397	18 083.82	301 397	18 083.82	300 389	18 023.34	300 389	18 023.34
	Graduation, adding 10 per cent.	723 370	43 402.20	1 027 116	61 626.96	651 709	39 102.54	951 467	57 088.02	735 244	44 114.64	1 040 306	62 418.36	729 354	43 761.24	1 034 327	62 059.62	767 617	46 057.02	1 069 014	64 140.84	656 698	39 401.88	957 087	57 425.22
	Railway, double track, and Contingencies,	432 780	25 966.80	1 459 896	87 593.76	471 046	28 262.76	1 422 513	85 350.78	469 368	28 162.08	1 509 674	90 580.44	462 909	27 774.54	1 497 236	89 834.16	462 885	27 773.10	1 531 899	91 913.94	466 975	28 018.50	1 424 062	85 443.72
Repairs.	Extraordinary repairs of Graduation, plus 10 per cent.	56 310	3 378.60	1 516 206	90 972.36	55 376	3 322.56	1 477 889	88 673.34	61 929	3 715.74	1 571 603	94 296.18	60 352	3 621.12	1 557 588	93 455.28	63 670	3 820.20	1 595 569	95 734.14	55 341	3 320.46	1 479 403	88 764.18
	Ordinary repairs of Graduation and Masonry, with Superintendence,	153 606	9 216.33	1 669 812	100 188.69	138 458	8 307.47	1 616 347	96 980.81	144 231	8 653.83	1 715 834	102 950.01	145 733	8 744.00	1 703 321	102 199.28	155 909	9 354.55	1 751 478	105 088.69	141 523	8 491.35	1 620 926	97 255.53
	Repairs and renewals of Railway, double track,	198 979	11 938.76	1 868 791	112 127.45	216 573	12 994.36	1 832 920	109 975.17	215 801	12 948.08	1 931 635	115 898.09	212 832	12 769.92	1 916 153	114 969.20	212 821	12 769.24	1 964 299	117 857.93	214 701	12 882.08	1 835 627	110 137.61
Motive power and Machinery.	1st. Locomotive Engine and train of 10 Cars, with 30 tons of freight,	177 497	10 649.80	2 046 288	122 777.25	182 383	10 942.96	2 015 303	120 918.13	181 814	10 908.83	2 113 449	126 806.92	180 650	10 838.97	2 096 803	125 808.17	180 601	10 836.04	2 144 900	128 693.97	181 960	10 917.60	2 017 587	121 055.21
	1st. Locomotive Engine and train of 6 Coaches, carrying 67 passengers,	226 469	13 588.15	2 272 757	136 365.40	233 198	13 991.87	2 248 501	134 910.00	232 644	13 958.62	2 346 093	140 765.54	231 107	13 866.42	2 327 910	139 674.59	231 124	13 867.41	2 376 024	142 561.38	232 564	13 953.84	2 250 151	135 009.05
	2nd. Locomotive Engine and train with 30 tons of freight,	177 497	10 649.80	2 450 254	147 015.20	182 383	10 942.96	2 430 884	145 852.96	181 814	10 908.83	2 527 907	151 674.37	180 650	10 838.97	2 508 560	150 513.56	180 601	10 836.04	2 556 625	153 397.42	181 960	10 917.60	2 432 111	145 926.65
	2nd. Locomotive Engine and train, carrying 67 passengers,	226 469	13 588.15	2 676 723	160 603.35	233 198	13 991.87	2 664 082	159 844.83	232 644	13 958.62	2 760 551	165 632.99	231 107	13 866.42	2 739 667	164 379.98	231 124	13 867.41	2 787 749	167 264.83	232 564	13 953.84	2 661 675	159 883.19
	3rd. Locomotive Engine and train with 30 tons of freight,	163 608	9 816.47	2 840 331	170 419.82	168 494	10 109.63	2 832 576	169 954.46	167 925	10 075.50	2 928 476	175 708.49	166 761	10 005.64	2 906 428	174 385.62	166 712	10 002.71	2 954 461	177 267.54	168 071	10 084.27	2 832 746	169 964.76
	3rd. Locomotive Engine and train with 67 passengers,	226 469	13 588.15	3 066 800	184 007.97	233 198	13 991.87	3 065 774	183 946.33	232 644	13 958.62	3 161 120	189 667.11	231 107	13 866.42	3 137 535	188 252.04	231 124	13 867.41	3 185 585	191 134.95	232 564	13 953.81	3 065 310	183 918.60
	4th. Locomotive Engine and train with 30 tons of freight,	156 663	9 399.80	3 223 463	193 407.77	161 549	9 692.96	3 227 323	193 639.29	160 981	9 658.83	3 322 101	199 325.94	159 816	9 588.97	3 297 351	197 841.01	159 767	9 586.04	3 345 352	200 720.99	161 127	9 667.60	3 226 437	193 586.20
	4th. Locomotive Engine and train conveying 67 passengers,	226 469	13 588.15	3 449 932	206 995.92	233 198	13 991.87	3 460 521	207 631.16	232 644	13 958.62	3 554 745	213 284.56	231 107	13 866.42	3 528 458	211 707.45	231 124	13 867.41	3 576 476	214 588.40	232 564	13 953.81	3 459 001	207 540.04

[H.]

OFFICE OF THE TREASURER OF THE
Baltimore and Ohio Rail Road Co.
1st October, 1833.

PHILIP E. THOMAS, ESQ.
President of the Balt. and Ohio Rail Road Company.

Sir—I herewith transmit to you the following statement in relation to the fiscal operations of the Baltimore and Ohio Rail Road Company during the past year.

I am, very respectfully, &c.
GEORGE BROWN.
Treasurer of B. & O. R. R. Co.

The Baltimore and Ohio Rail Road Company, In Account with George Brown, Treasurer.

Actual balance on hand at the credit of the Company, as per last Annual Report - - -		$12,468.62
By cash received on 39.900 shares of stock, being $10 per share	$399,000.00	
" do received on 5 shares of stock fully paid - -	175.00	
		399,175.00
By cash received from Washington Rail Road, the amount due on account of surveys, as stated in last Report - - - - -		16,650.00
By cash received on account of Revenue from 30th September, 1832, to 30th Sept. 1833 - - -		191,678.35
		$619,971.97
To cash paid expenses of Transportation, (as per exhibit of the superintendent of transportation)	$83,880.76	
" cash paid repairs of the Rail Road, and of Machinery, construction of Depots, Salaries, and additional Animal Power, - -	76,190.18	
" Cash paid Stockton and Stokes, for an unsettled claim for furnishing Moving Power - - -	1,486.00	
" Cash paid machinery department, for carriages, wagons, engines, and salaries, - - -	62,215.30	

To Cash paid department of construction, for laying rails of the second track, and former unsettled claims	48,468:35	
" Cash paid Surveys on the Potomac, and salary of Chief Engineer	3,123.37	
" Cash paid Washington Rail Road stock - - - - -	*93,880.00	
" Cash paid Chesapeake and Ohio Canal Company on account of construction of the Rail Road West of the Point of Rocks - -	110,833.34	
" Cash paid Office expenses and contingencies - - - - - -	3,235.05	
" Cash paid Law expenses -	4,452.12	
" Cash paid Interest on Loans -	22,325.18	
" Cash paid Mechanics Bank on account of Loans - - -	25,000.00	
" Cash paid Dividends - -	30,061.36	
Balance on hand this day -	54,820.97	
		$619,971.97

P. S.—October 10, 1833—List of Real Estate acquired since the last Annual Report, or, omitted in that Report.

1. One undivided fifth part of a Lot of ground on Pratt street, and a Lot adjoining thereto, purchased from S. S. Buchanan, by Deed bearing date on or about the 10th of October, 1833, and recorded in Baltimore County Court, which one fifth is refered to, in Document N. No. 4, article No. 3 in my last Report.

2d. A Lot of ground omitted in my last report, containing about one acre, situated at the junction of the Lateral road to Frederick with the main road leading to the Point of Rocks, acquired by the inquisition of a Jury whose verdict is recorded in Frederick County.

GEORGE BROWN, *Treasurer*
Balt. & Ohio Rail Road Company.

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* To meet this sum, a loan has been negotiated with the Union Bank of Maryland, for the payment of the subscription of this Company in the Washington Rail Road, the first instalment of which, is payable this day, and will appear credited in the next Annual Report.

No. 6.]

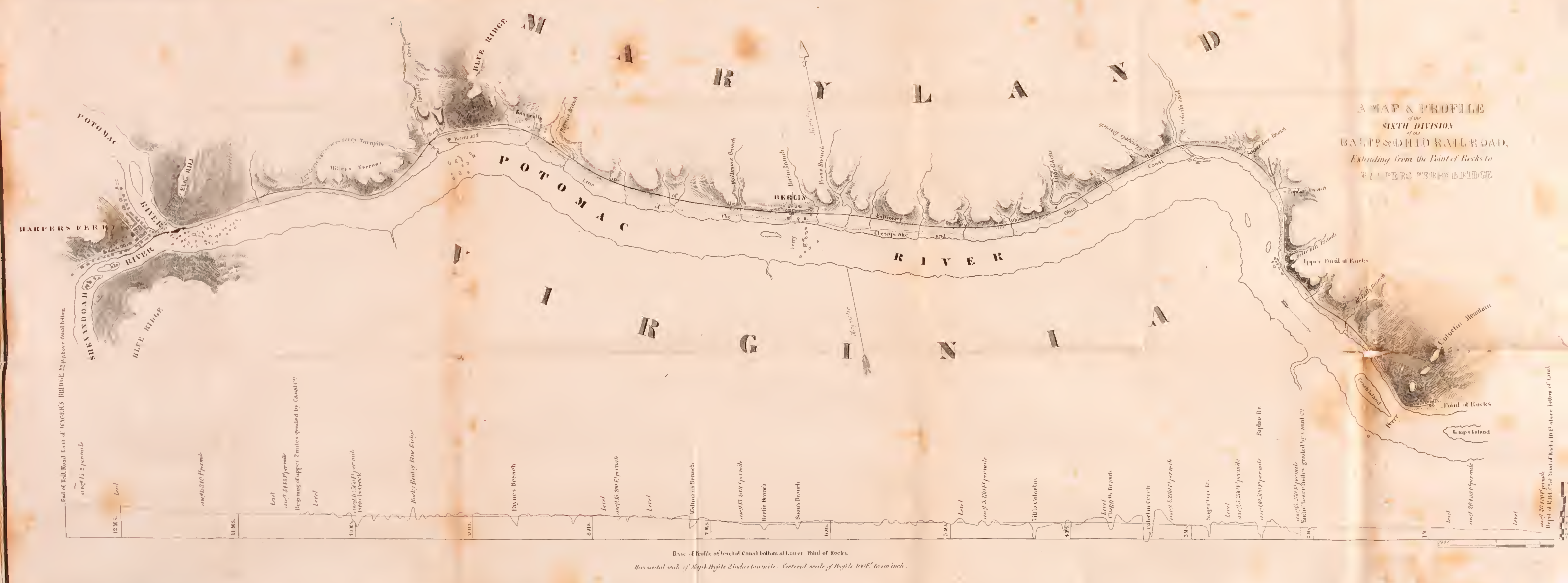
Abstract of Tonnage transported Eastwardly on the Baltimore and Ohio Rail Road, from the 1st October, 1832, to the 30th September, 1833, inclusive.

Months.	Flour.		Tobacco.		Grain.	Meal, &c.	Provisions.	Live Stock.	Whiskey.	Granite.	Soap Stone	Paving Stone.	Lime and Lime-stone.	Firewood.	Lumber.	Bark.	Ore.	Iron.	Wool.	Cotton.	Feathers.	Leather.	Hardware.	Cotton Goods.	Paper.	Miscellaneous.	Total.
	Bbls.	Weight.	Hhds.	Weight.																							
		Tons.		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
October,	11,774	1,135. 7.0. 0	59	21.11.2. 7	22.12.2.14	123.11.1.14	10.17.0. 7	- -	- -	402. 1.1. 0	3. 1.0.0	4. 5.0.0	218.19.3. 0	42.19.3. 0	10. 0.0. 0	- -	- -	91. 1.3. 0	- -	- -	- -	15. 0.2. 7	51. 6.2. 0	18. 8.1. 0	- -	72. 8.1.21	2,276.11.3.14
November,	16,169	1,559. 3.0. 7	20	8. 20. 0	18.14.3. 0	122. 5.3. 0	9.13.0.14	- -	- -	215.12.2. 0	- -	16.17.1.0	321.17.1. 0	436.10.3. 0	53. 2.0. 0	- -	101. 6.2.0	73. 1.1. 0	- -	- -	- -	19.18.2.14	51.16.1. 0	16.14.2. 0	0.19.0. 0	72.15.0.21	3,092. 9.3. 0
December,	17,089	1,617.17.1.14	8	3. 00. 0	41.18.0.14	129.16.1.14	60.17.2.21	- -	- -	219.18.3. 0	4.10.0.0	- -	310. 8.0. 0	437. 2.1. 0	93. 7.3. 0	- -	6. 1.2.0	183. 2.0. 7	- -	- -	- -	17. 7.0. 0	46. 6.2. 7	16. 3.2. 0	1.12.0. 0	77.14.3. 0	3,300. 3.2.21
January,	17,900	1,726. 1.1.14	21	8. 70. 7	27.19.1. 0	111. 7.1.14	49. 2.1.21	3.12 0.0	- -	289. 6.0. 0	- -	- -	55. 7.0. 0	391.10.2. 0	32. 2.1. 0	- -	- -	107.16.1. 0	- -	- -	- -	14. 5.2. 0	25. 4.1.14	13. 9.0. 0	3. 3.3. 0	31.15.2.21	2,873. 9.3. 7
February,	17,236	1,661.10.1.21	5	2. 0.0.21	32. 6.2.14	75. 6.0.14	50.14.2. 7	14.12.0.0	5.18.0. 0	102. 8.2.21	1. 4.2.0	- -	38. 8.0. 0	189. 0.1.14	38. 4.3. 0	- -	- -	78. 6.3. 7	- -	- -	3. 6.0. 7	8. 4.0.21	28.17.2.21	10. 6.3. 7	0.15.3.21	17. 0.0.14	2,358.11.3.14
March,	19,276	1,858.12.3.21	27	10. 0.2. 0	48. 2.3. 7	52. 6.0.21	25.10 3. 0	12. 9 1.0	4. 0.0. 0	227. 4.2.14	- -	- -	86. 4.2. 0	82. 9.1.14	71.19.0. 7	- -	- -	95. 9.1. 7	0. 6.1.21	- -	1.13.3. 0	16. 1.1.14	31. 5.1.21	8. 0.2.14	2. 7.2. 7	22. 0.1.21	2,656. 4.3.21
April,	15,072	1,453. 7.2.21	68	27. 0.0. 0	19.17.0. 7	45.19.2.14	52.10.3. 0	2.13.2.0	2. 1.0. 0	550 14.2. 7	5. 6.0.0	- -	158. 4.0. 0	30. 9.3. 0	22. 4.1.21	- -	41.18.3.0	107.12.1.21	- -	0.12.2.21	2. 1.2. 0	23.14.3. 0	52.15.2. 7	4.19.3. 0	2. 5.2. 7	51. 7.3.21	2,660.17.1. 7
May,	10,737	1,035.15.3. 7	91	37.16.3. 7	18.13.2. 0	27.13.0.21	9. 5.1.14	3. 8.2.0	12. 2.1. 7	488.17.1. 0	- -	- -	165. 7.0. 7	4.10.0. 0	26. 9.0. 0	8. 6.0.0	84.17.3.0	98.14.0.14	0.14.0. 0	1. 2.1.14	0. 3.0.21	13. 3.0.21	67. 2 2.21	13. 7.2. 0	5. 6.0. 0	73.17.0.21	2,196.12.3. 7
June,	13,159	1,269. 0.3. 7	82	33.11.1. 0	0.19.3. 0	70.12.1. 7	5. 0.0.14	- -	15. 8.0. 0	583. 7.0. 0	11.12.3.0	- -	113. 3.2.21	- -	- -	10. 1.3.0	167.12.0.0	74.10.2.14	5.16.3.21	0.19.0. 0	- -	13.17.2. 7	60.14.2.21	6. 9.2. 0	2. 9.2. 0	68.13.3. 7	2,514. 1.0. 7
July,	7,117	683. 6.2. 0	51	20. 8.1. 7	16. 9.0. 0	29.15.2.14	0. 8.2.21	- -	2. 0 0.21	1,770. 0.3. 0	16.14.2.0	- -	68. 4.1.21	- -	31.10.2. 0	4.15.0.0	39.17.3.0	78. 1.2. 0	2. 8 0. 0	3.10.0.14	- -	13. 3.2.21	53. 2.1. 7	10.12.2. 0	4. 5.1. 7	96. 5.0.14	2,914.19.3. 7
August,	13,695	1,319. 3.3.14	106	42. 2.2. 0	19. 9.1. 7	128.15.1. 7	5. 2.1.14	- -	15. 6.0 21	3,689.13.2. 0	- -	- -	128.10.1. 0	- -	10. 0.0. 0	3.10.2.0	81. 0.1.7	63. 1.2. 0	3.11.2. 7	5. 6.1. 0	- -	15.13.1. 7	78.16.3. 7	2.12.2. 0	2. 5.1.14	83. 5.0.14	5,697. 6.2. 7
September,	10,733	1,010.17.3. 0	90	31. 7.3. 7	9. 5.1. 0	138. 6.1.14	9.16.3. 7	14.10.3.0	12.11.2.14	2,917.12.0. 0	- -	- -	154.11.3.21	- -	6.11.0. 7	3.17.3.0	2.14.2.0	91.17.1. 0	6. 8.3.14	6.16.3.14	- -	21.11.2. 0	30. 0.3.14	1.16.1. 0	2.12.1.14	85. 2.0. 7	4,591. 9.2.21
	169,957	16,390. 4.2.14	631	251. 8.0. 0	279. 8.0. 7	1055.15.2.14	288.19.3. 0	51. 6.0.0	69. 7.1. 7	11,456.16.3.14	42. 8.3.0	15 .2.1.0	1,829. 5.3.14	1,614.12.3. 0	395.10.3. 7	30.11.0.0	525. 9.0.7	1,142.14.3.14	19. 5.3. 7	18. 7.1. 7	7. 4.2. 0	195. 1.1. 0	577. 9.3. 0	123. 0.2.21	28. 2.1.14	758. 5.3.14	37,165.19.0.21

RECAPITULATION.

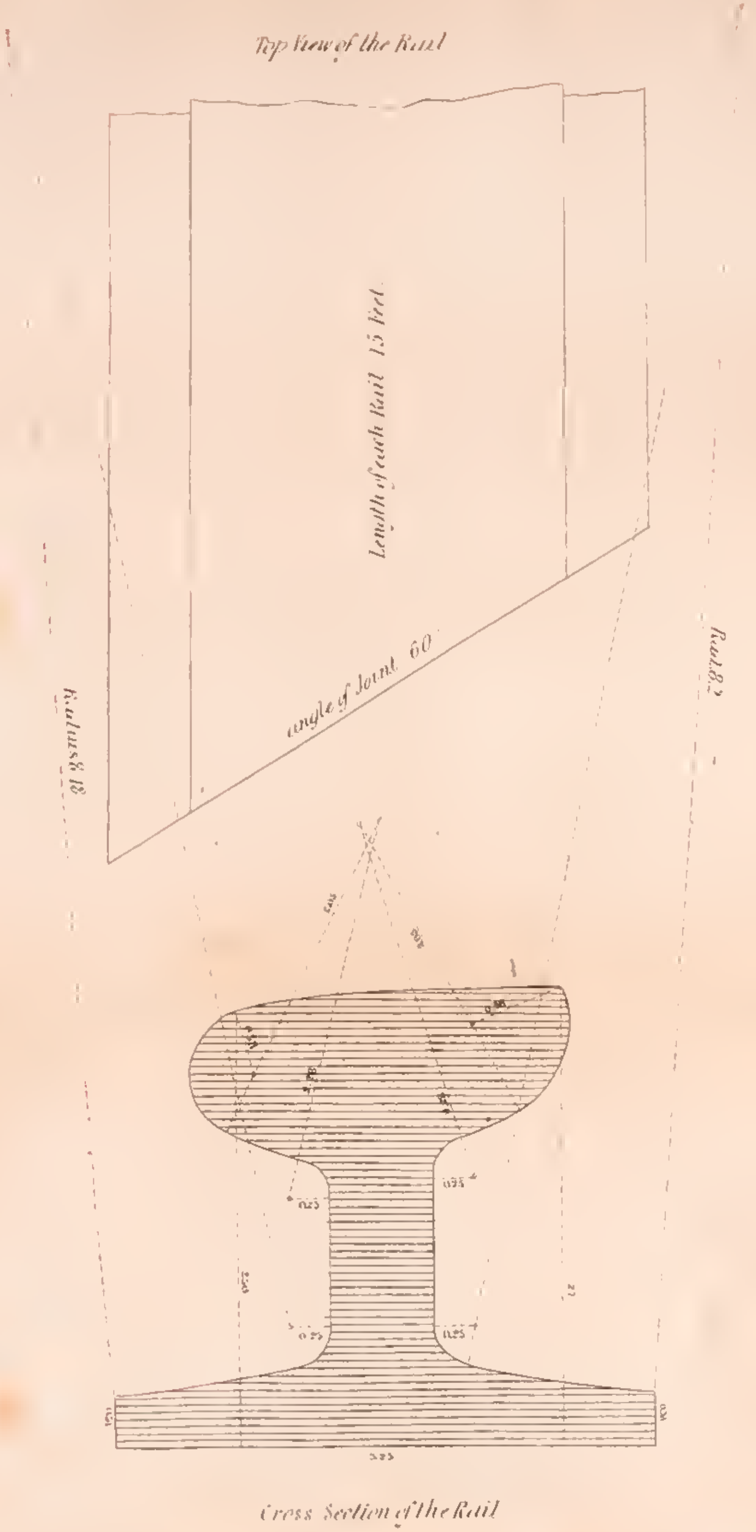
Commodities.	*Weight.*
	Tons.
Flour, 169,957 barrels, -	16,390. 4.2 14
Tobacco, 631 hhd's. - -	351. 8.0. 0
Grain, - - -	279. 8.0. 7
Meal, &c. - - -	1,055.15.2.14
Provisions, - - - -	288 19.3. 0
Live Stock, - - -	51. 6.0. 0
Whiskey, - - - -	69. 7.1. 7
Granite, - - - -	11,456 16 3.14
Soap Stone, - - - -	42. 8.3. 0
Paving Stone, - - -	15. 2 1. 0
Lime, and Lime Stone, - -	1,829. 5.3.14
Fire Wood, - - -	1,614.12.3. 0
Lumber, - - - -	395.10.3. 7
Bark, - - - -	30.11.0. 0
Ore, - - - - -	525. 9.0. 7
Iron, - - - -	1,142.14.3.14
Wool, - - - -	19. 5.3. 7
Cotton, - - - -	18. 7.1. 7
Feathers, - - - -	7. 4.2. 0
Leather, - - - -	195. 1.1. 0
Hardware, - - - -	577.9. 3. 0
Cotton Goods, - - -	123. 0.2.21
Paper, - - - -	28. 2.1.14
Miscellaneous, - - -	758. 5.3.14
Total,	37,165.19.0.21

A MAP & PROFILE
of the
SIXTH DIVISION
of the
BALT° & OHIO RAIL ROAD,
Extending from the Point of Rocks to
HARPERS FERRY BRIDGE



Base of Profile at level of Canal bottom at Lower Point of Rocks.

Horizontal scale of Map & Profile 2 inches to a mile. Vertical scale of Profile 100 Ft to an inch.



Top View of the Rail

Cross Section of the Rail

Rolled Iron Rail designed for the Balt^o. & Wash^n. Railway.

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